



Digitized by the Internet Archive
in 2017 with funding from
IMLS LG-70-15-0138-15

<https://archive.org/details/plantsgardens2194unse>



BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

Spring, 1946

Trees for Special Purposes

Tree Forms and Families

Transplanting and Pruning
Trees

The Town Forest

An Arboretum Hobby

Layout of the Small Place



BROOKLYN BOTANIC GARDEN
OF
THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

Officers of the Institute

EDWARD C. BLUM

Chairman, Board of Trustees

ADRIAN VAN SINDEREN

President

WALTER H. CRITTENDEN

First Vice-President

CHARLES PRATT

Second Vice-President

SIDNEY W. DAVIDSON

Third Vice-President

EDWIN P. MAYNARD

Treasurer

JAMES E. GIBBONS

Secretary

Ex Officio Members of the Board

The Following Officials of the City of New York

THE MAYOR THE COMPTROLLER

THE COMMISSIONER OF PARKS

Botanic Garden Governing Committee

PHILIP A. BENSON, *Chairman*

MISS HILDA LOINES, *Vice-Chmn.*

WALTER HAMMITT

EDWARD C. BLUM, *Ex officio*

WILLIAM T. HUNTER

WILLIAM G. CREAMER

EDWIN P. MAYNARD

WALTER H. CRITTENDEN

LEONARD P. MOORE

LEWIS L. FAWCETT

ROBERT MOSES, *Ex officio*

MRS. LEWIS W. FRANCIS

JOHN C. PARKER

ANDREW J. GONNOUD

DONALD G. C. SINCLAIR

ADRIAN VAN SINDEREN, *Ex officio*

Director of the Botanic Garden

GEORGE S. AVERY, Jr.

PLANTS GARDENS

Early-flowering cherry, *Prunus subhirtella*

NEW SERIES

Spring, 1946

VOL. 2—No. 1

CONTENTS

Cover.....	Willows along the Garden Brook
Frontispiece.....	Basking Ridge White Oak
Announcement.....	George S. Avery, Jr. 3
Layout of the Small Place.....	Janet Darling 4
Tree Forms.....	John C. Wister 7
Tree Families.....	Henry K. Svenson 10
Trees for Special Purposes.....	Charles F. Doney 15
Trees for Lawn and Garden.....	Henry E. Downer 27
Nut Trees.....	John W. Hershey 30
Trees for City Streets.....	E. A. Piester 33
Trees to Avoid on the Small Place.....	Gertrude M. Smith 37
Unusual Trees.....	Laura L. Barnes 39
Ornamental Crab Apples for Flower and Fruit.....	Donald Wyman 42
How to Transplant Trees.....	Arthur F. Paul 44
How to Prune Trees.....	Stanley W. Bromley 48
How to Have Healthy Trees.....	H. Gleason Mattoon 50
The Town Forest.....	Harris A. Reynolds 52
A Hemlock Arboretum.....	Charles F. Jenkins 56
Annuals.....	Nellie B. Allen 58
Within the Brooklyn Botanic Garden.....	61
Among the Contributors to this Issue	Page 3 of cover

Except where otherwise noted; drawings by Maud H. Purdy;
photographs by Louis Buhle.

JOHN C. WISTER, *Editor*



Courtesy New Jersey State Dept. of Conservatio

Basking Ridge White Oak, Somerset County, New Jersey

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN 25, NEW YORK
TELEPHONE: MAIN 2-4433

Spring 1946

FRIENDS OF PLANTS & GARDENS:

It is Spring again. The flow of sap in the maples, the swelling buds, the early skunk cabbage, and "fiddleheads" unfolding into fronds, all exemplify the release of life and the birth of new life with its attendant mysteries, hopes, and potentialities.

PLANTS & GARDENS welcomes the Spring. We celebrate doubly on this, our first birthday, for we also welcome our new Editor, John C. Wister, who will carry on the work so ably started by Montague Free.

About this issue, a salute to the trees! Trees are the superlatives of plant life: the tallest, the oldest, the strongest, and to many the most ornamental plants of our Earth. From the sublime 3,000 year-old redwoods of California, to the over-dramatized weed, "the tree that grows in Brooklyn," trees are our heritage.

The many ways we enhance our heritage are told in this issue. "A Town Forest" should interest those who want to honor our war heroes -- what more fitting living memorial could there be? Trees have had their place in city planning since the Revolutionary fathers laid out their elm-lined village greens, and they have not lost their place today. Our forebears slashed the forests, to clear the land for crops. The lumber kings of the nineteenth century followed their style. We know now, however, that trees themselves are crops, to be planted, cultivated, and harvested for lumber and other forest products. And the chemists are making from trees things of which our forefathers could not have dreamed.

Trees are also affairs of the heart, for what is a landscape without them? We have a warm spot for them, the wind-break of spruce, the evergreen-dotted hillside, and the roadside of dogwood. Some lucky men have "tree hobbies" ("A Hemlock Arboretum") and others know just where to plant the new apple. Then there are the many "whys and hows" of trees. Botanists say that trees are on their way out, that in the evolutionary scheme they have seen better days. But while we are here and they are here, we say: long live the trees.

Sincerely yours,

George S. Bailey Jr.
Director



Durand photo

Garden in Washington, D. C.

THE LAYOUT OF THE SMALL PLACE

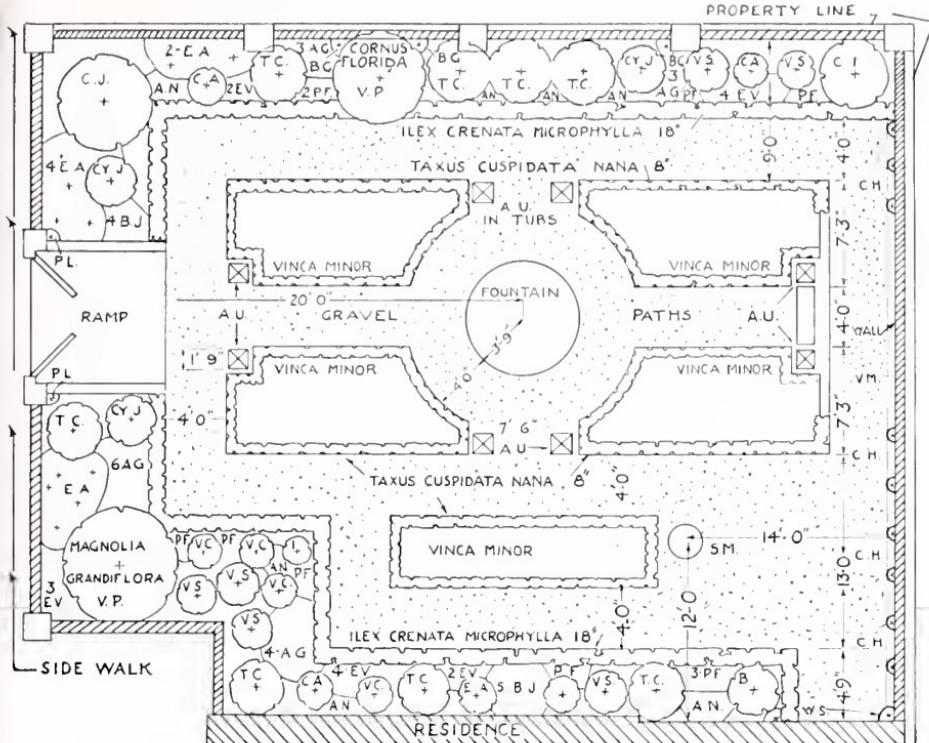
A Small City Garden.

Janet Darling

ALMOST everyone will agree that it is easy to express a few simple facts in a 1-page letter. But when the same ideas must be condensed into a 50-word telegram, the problem becomes considerably more difficult; for the telegram must be concise, and yet it must lose none of the meaning of the letter. Just such a comparison can be made between designing the large estate and designing the small garden. In estates, or in parks or large-scale public projects, the designer has the advantage of almost unlimited space and materials to work with. In a small garden, however, space is at a premium, and every square inch must be made to count. The eye of the observer is closer, too; and so each tiny detail takes on greater importance than when viewed from afar. While it is certainly the more common problem, the layout of the small

place is in every way a far more difficult task both for the layman and for the professional designer.

Two general principles govern the design of all places, large or small. First, the design must be suited to the conditions of the site. It must be influenced by existing grades, natural features such as large trees, existing soil conditions, and existing surroundings. Any design is immensely more successful if it is based on the conditions which exist. This does not mean that if you have a bank too steep for use, or an overgrown thicket of small weak-wooded trees, or a particularly unattractive house next door, you must leave the status quo. (By all means remedy these faults by skillful planning and planting.) But it does mean that if you have an interesting outcropping of rock, a difference of level, or a particularly fine tree in the wrong place, you should start your planning with what you have to work with. Make your design fit your property, not your property fit your de-



A WALLED CITY GARDEN

Plan by author

Key to Plant List

A. G.	<i>Abelia grandiflora</i>	Glossy Abelia
A. N.	<i>Azalea nudiflora</i>	Pinxter Bloom Azalea
A. U.	<i>Agapanthus umbellatns</i>	African Agapanthus
B.	<i>Buxus sempervirens</i>	Boxwood
B. G.	<i>Bignonia grandiflora</i>	Chinese Trumpet creeper
B. J.	<i>Berberis Julianae</i>	Wintergreen Barberry
C. A.	<i>Cornus alba sibirica</i>	Siberian Dogwood
C. H.	<i>Cotoneaster horizontalis</i>	Rock Cotoneaster
C. L.	<i>Cryptomeria japonica var. Lobbii</i>	Lobb Cryptomeria
C. J.	<i>C. japonica</i>	Japanese Cryptomeria
Cy. J.	<i>Cydonia japonica</i>	Japanese Flowering Quince
E. A.	<i>Euonymus alatus</i>	Winged Euonymus
E. V.	<i>E. vegetus</i>	Bigleaf Euonymus
I.	<i>Ilex crenata microphylla</i>	Littleleaf Holly
P. F.	<i>Pieris floribunda</i>	Mountain Pieris
P. L.	<i>Pyracantha Lalandii</i>	Laland Firethorn
T. C. N.	<i>Taxus cuspidata nana</i>	Japanese Yew
T. C.	<i>Tsuga canadensis</i>	Canada Hemlock
V. C.	<i>Viburnum Carlesii</i>	Korean Spice Viburnum
V. M.	<i>Vinca minor</i>	Periwinkle
V. P.	<i>Vaccinium pensylvanicum</i>	Smoothleaf Lowbush Blueberry
V. S.	<i>Viburnum Sieboldii</i>	Siebold Viburnum
W. S.	<i>Wisteria sinensis</i>	Chinese Wisteria
	<i>Cornus florida</i>	Flowering Dogwood
	* <i>Magnolia grandiflora</i>	Southern Magnolia

* Farther north use *Magnolia acuminata*, Cucumber tree.

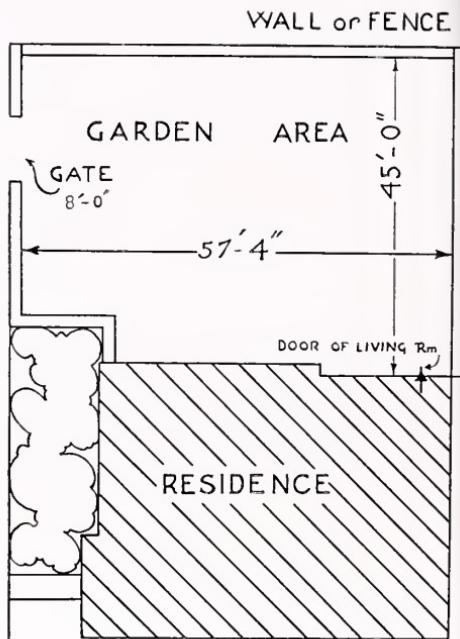
sign. A Spanish garden will look just as much out of place on a New England hillside as an evening dress on the tennis court.

Second in importance is designing to suit your requirements. Ask yourself this question: "What do I want from this piece of land?" If you have a bit of property on the side of your house, you may want something pretty to look at, you may want a place to grow flowers and vegetables, or you may want a place for the children to play. If your garden is not designed to fulfill your *own* needs, it fails from the start.

Here, next to a city house, is a small bit of land. In this case there was very little to start with: no trees, no view, and no interesting difference in level. The owners wished to have a pleasant spot to look at from their windows in winter, the interest of color and bloom in the spring without excessive maintenance, and a spot where they could sit outdoors in the summertime.

The first step, naturally, was to provide enclosure. Here privacy was achieved by means of a brick wall, which at the same time acts as a background for the planting. Secondly, a focal point of interest was created by the central pool with its single jet of water. A simple plan of shrub beds around the outside, with four similar beds around the pool, gives a pleasant pattern from upstairs. In one corner is a large specimen magnolia, providing shade for outdoor sitting, and giving scale to the rest of the planting by its comparatively large size.

Everything is reduced in scale in this garden. The gravel paths are narrow; the pool is small; and, because of the limited space, the shrub beds are so narrow that the plants are almost espaliered



against the wall. The four main beds are planted with periwinkle (*Vinca minor*); and the edgings are evergreen, for winter interest. Gravel paths are used because of the difficulty of maintaining grass in a hot dry summer. Bloom is concentrated in the spring, and is achieved through shrubs; but annuals and bulbs could be added to the beds of periwinkle if desired.

A small area such as this is not the problem of city dwellers only. Many a suburban house has such a plot (perhaps off the living room wing), which could be turned into an outdoor living room. In any small space the suitability of the layout and the simplicity of the design are the factors which determine the success or failure of the garden.



TREE FORMS

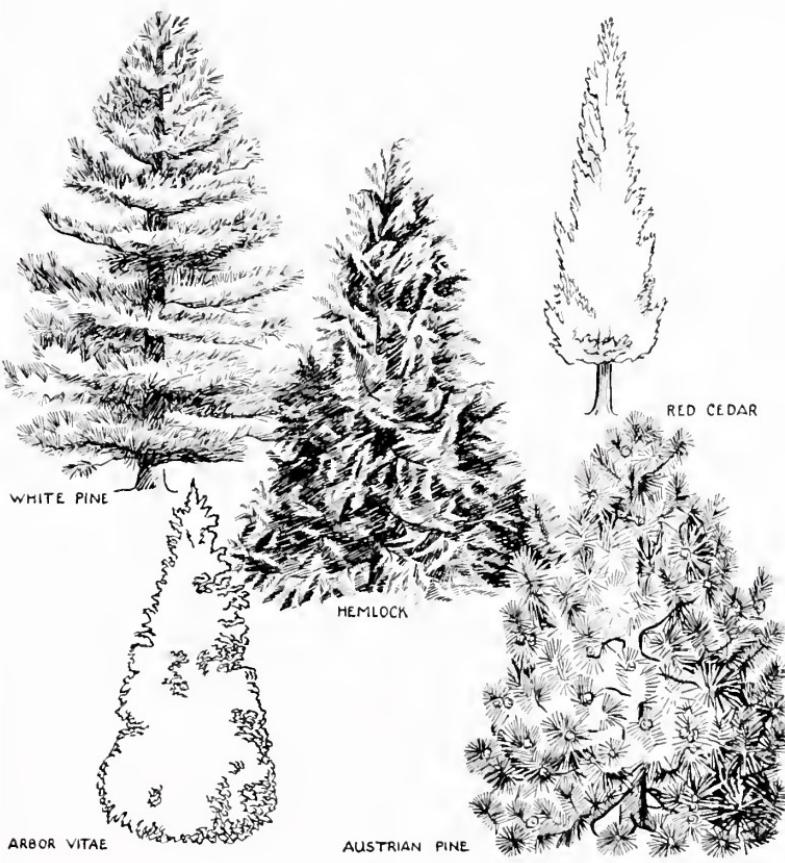
John C. Wister

Drawings by Natalie Harlan Davis. From "Four Seasons in Your Garden," by John C. Wister, courtesy J. B. Lippincott Co.

WHEN the subject of trees is presented in any book or magazine many different points of view on the part of the authors become apparent. Some people will become very poetic about the beauty of the trees, others will consider them from the standpoint of their value in giving shade or edible fruit or for producing lumber. Still others will want to consider the types of soils in which the various species may flourish or the use

that they may have in different parts of the garden picture.

In this short discussion I wish to present the matter of the form or outline of some of our most familiar trees. It is assumed, of course, for the purposes of discussion that the trees are in the open because all trees under forest conditions tend to grow tall and narrow with foliage mostly at the top. Trees which have developed in the open, on the other hand, present many different forms from the tall, with narrow spike, to the round vase-shaped or the weeping type. A few examples of each of these cases will be shown in the accompanying illustrations.



Evergreen tree forms

Evergreens

Considering the evergreen trees first, as they present much the same picture at any time of year, we have the very narrow spike of our native red cedar (*Juniperus virginiana*). This tree is the one most often used in the climate of our middle States to give accents such as are attained by the famous Italian cypress about which so many travelers speak upon their return from abroad. The Italian tree, of course, is not hardy in our climate although it can be well grown in California and other mild sections. It is quite true that the red cedar in old age loses its compact form and becomes gnarled, although picturesque, but as it is years before this happens, in most garden practice it is used to make the perpendicular line.

From Philadelphia south *Cryptomeria japonica Lobbii* is used somewhat for this purpose but is not so often seen as it is difficult to get and so expensive.

Some gardeners use the arbor-vitae (*Thuja*) and clip it so that it retains practically the same shape as the red cedar. In the drawing it will be noticed that this is rather broader at the base than the cedar and is apt to retain even its lowest foliage but, like the red cedar, the American arbor-vitae is a very variable plant and many forms have been selected for different types of growth, some of them extremely narrow, others broader or even rounded.

The dense, rather rigid form of the Austrian pine is shown in the accompanying illustrations in comparison with the more open and more graceful form of the white pine. The Austrian pine is a useful tree but in most American climates not so long lived as the white pine. While its more rigid form has certain uses in making garden pictures it is generally not so much desired as that of our American species. An even more graceful tree than our native white pine is its relative from the Himalayas now called by botanists *Pinus Griffithii*. This tree is not too hardy and is seldom seen north of Phila-

delphia; in fact it was seriously injured there during the cold winter of 1934 and 1935.

The most graceful of all the evergreens is the hemlock. The drawing illustrates the typical plant of the northern species. The Carolina hemlock is even more graceful.

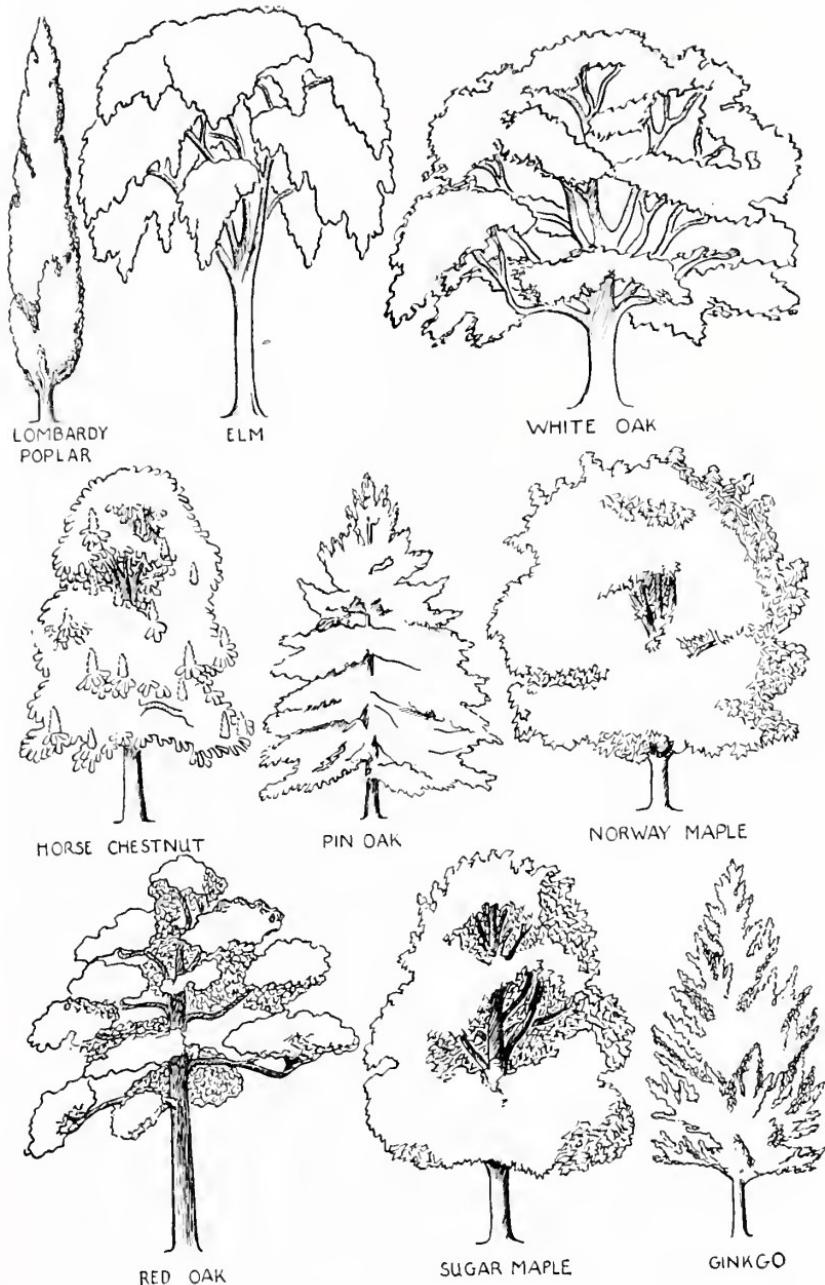
Deciduous Trees

Turning now to the deciduous trees, we must remember that they present two quite different aspects: the form of their outline when it is covered with foliage in the summer and the skeleton of the branches in the winter months.

The best-known tree for the narrow spike is the Lombardy poplar, universally known and beloved, but alas a tree which, with us, is not long-lived. Even though we may lose it in ten or fifteen years it is worth planting for its rapid growth and the accent it makes in the garden picture. Many other trees are said to grow like it but, in my opinion, the resemblance is pretty far fetched as most of them do not give the typical appearance of the Lombardy poplar in the accompanying drawing. Nevertheless, columnar Norway maples, sugar maples, oaks, etc. may be very useful for street trees on narrow streets.

The vase form of tree is best known to us from the American elm, so universally planted, but we can get much the same effect from the honey-locust, Kentucky coffee-tree, the hackberry and others. More oval in form are the horse-chestnuts, the shagbark hickory, the sycamore, the sugar maple, the linden and various oaks. More round in form are the white oak, Norway maple and its form the Schwedler maple, the yellow-wood, the black walnut and the scarlet oak.

We sometimes describe as pyramidal in form, the ginkgo and our native tupelo (although both of these, particularly at great age, become exceedingly irregular), the European larch, the cucumber-tree, the American linden. The pin oak is usually classified with these in form yet



Deciduous tree forms

the accompanying illustration shows how different the effect is. Even though the main outline is the same, the drooping branches make the total effect quite different. Finally, there are the weeping forms familiar to us in the various weeping willows and weeping birches.

Just as the general outline is different in the summer months so is the effect in winter quite different on account of the types of the main branches. The tremendous, sturdy frame of the white oak, for instance, is quite different from the branches of the elms which droop at the tips, or those of the pin oak which grow down from the trunk rather than upward, or of the red oak or some of the maples. The Kentucky coffee-tree has a particular distinction in winter because of the lack

of the many small branches which fill the outline of an elm with the tiniest of traceries.

Many people who love trees seem to get as much pleasure from them in winter as in summer because of the different effects from the types of small branches.

Many additional drawings could, of course, be used to show step by step the many gradations between some of the types which I have illustrated here and there could be endless photographs to illustrate the winter effect of the branches against the sky. Persons desiring more detailed treatment of some of the points mentioned are referred to the September-October 1945 Bulletin of the Morton Arboretum, Lisle, Ill., and to the many fine books on the subject.



TREE FAMILIES

Henry K. Svenson

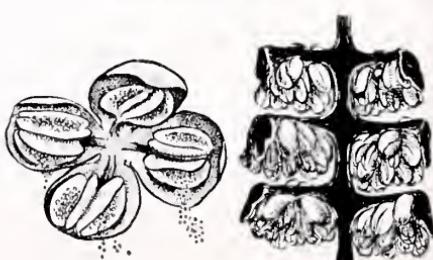
Photos courtesy of Dr. R. P. Wodehouse

TREES of our temperate zone emerge from a long winter hibernation, and many of them immediately burst into flower. Some, such as the Asiatic magnolias and flowering almonds, have conspicuous blossoms. So do our own magnolias and related tulip tree, though the flowers of the latter unfortunately are obscured by foliage. The redbud has flowers borne directly on the trunk, a characteristic of the chocolate tree and many others of the tropics. But for the most part, the trees of northeastern United States have small inconspicuous flowers, as shown in the accompanying sketch of part of an alder catkin. The amount of pollen produced by catkin-bearing trees is relatively enormous. The production may be judged from our picture of white birch catkins

which have been lightly tapped at the height of the flowering season, resulting in a veritable cloud of pollen. Coniferous trees such as pines and spruce also produce vast amounts of pollen, sometimes in sufficient quantity to cover the surface of the ocean in areas where the trees abound and at times when the wind is just right.

As a rule, wind-pollinated flowers are smaller and less brightly colored than insect-pollinated. The small size may be judged by alder flowers—six of which are shown in a portion of catkin in the adjoining drawing. Each flower is about one-quarter inch across, and consists of four anthers and associated green bracts.

A single flower and a section through a portion of alder catkin





White birch catkins shedding pollen

But some insect-pollinated trees have small flowers—perhaps due to exceptional fragrance or minute pollinating insects or a combination of factors. At any rate, most of our native trees have inconspicuous flowers, though many of the blooms show remarkable construction and brilliance when looked at under a microscope. In many trees, the pollen and seed-bearing pistillate flowers are usually separate. The Greek word *oikos* (meaning "house") is used to describe the situation: if both kinds of flowers are on the same tree, there is only one household and the tree is *monoecious* ("one house"); if each kind of flower is on a separate tree, there are two households, and the tree is therefore *dioecious* ("two houses"). For example, oak trees are monoecious (pronounced *mōn-ē-shus*); most hollies are dioecious. Transitional, or mixed types, are known as "polygamous."

If we find small flowers in a certain tree we may expect to find small flowers in its relatives—that is, in members of the same family. For example, the members of the dogwood family have small flowers. What we see in the flowering dogwood is no exception, for the white bracts are really modified leaves, similar to the red (or sometimes white) leaves which surround the flowers of the well-known *Poinsettia*.

Taking into consideration these principles, a classification of trees of the northeastern States now follows:

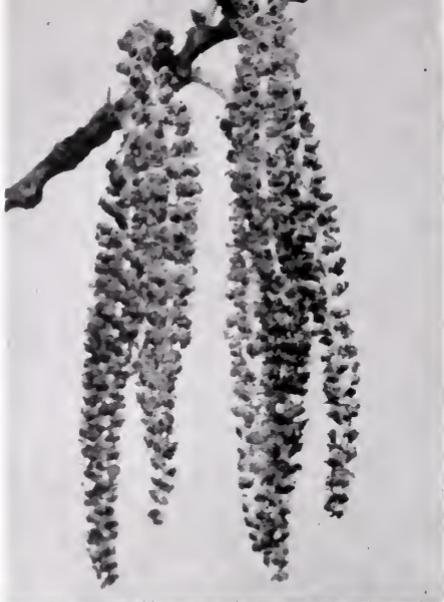
PINE FAMILY

Includes pines, larch, spruces, firs, hemlock, cypress, arbor-vitae and juniper. In all of these the flowers are borne in scaly catkins. The scales accompanying the seed-bearing flowers are usually hard and woody and remain to form the "cones" of pine or spruce which often last for years, or the berry-like cones of juniper and red cedar. The pollen-bearing catkins, appearing at the ends of the branches in early spring, have soft scales which quickly disintegrate.

WILLOW FAMILY

A few willows, such as the common pussy-willow, are insect-pollinated and about the flowers in early spring may be seen bees and other insects. Most of them are wind-pollinated and have more obscure flowers. In the large introduced trees (*Salix alba* and its varieties) the catkins appear with the leaves and are not at all conspicuous.

Closely related are the poplars, aspens and cottonwoods. The long worm-like pollen-bearing catkins are often a nuisance on sidewalks; the seed-bearing flowers in some species produce cottony seeds, which float about in the air and may become an even greater nuisance.



Poplar pollen-bearing catkins

WALNUT FAMILY

The walnut, butternut, and hickories always have compound leaves, with a pleasant resinous odor. The pollen-bear-

Walnut pollen-bearing catkins



ing catkins are similar to those of the alder, but greenish. The fruits (nuts) are not borne in catkins.

BIRCH FAMILY

In hornbeams, birches and alders both pollen-bearing and seed-bearing flowers are in catkins. Seeds of birches are winged and are carried for long distances in the air.

BEECH FAMILY

The seed-bearing flowers produce acorns, chestnuts or beechnuts. In the oaks, these flowers (forerunners of the



Beech pollen-bearing catkins

Oak pollen-bearing catkins



acorns) may be seen early in the spring by means of a hand lens. In each species the prominent 3-lobed stigmas are distinct and well-marked in structure and design. The pollen-bearing flowers are in catkins.

ELM FAMILY

To this family belong the elms and hackberries. The flowers are no longer in catkins but appear as small greenish clusters at the time the leaves are unrolling. The flowers may be perfect (that is, with stamens and pistils in the same



Elm flowers

flower) or there may be various transitions to monoecious or dioecious types. In the elm the fruit is small and winged; in the hackberry it is an edible drupe (i.e., with a stone at the center, as in the cherry).

MULBERRY FAMILY

In the mulberry, the small greenish pollen-bearing flowers are borne in catkin-

like structures; the seed-bearing flowers are equally small, but become enlarged in fruit to form the well-known mulberry. Each mulberry is really a group of small individual fruits, developed from single flowers. The red mulberry (*Morus rubra*) is a native tree with rough hairy leaves and red fruit; the white mulberry (*Morus alba*) with smooth leaves and white-to-purplish fruit, was originally introduced for raising silkworms.

LAUREL FAMILY

Sassafras is the only native member of this family, which is widespread in the tropics. The flowers are greenish-yellow, appearing in clusters with the leaves. The bright blue fruits appear only on occasional trees.

WITCH-HAZEL FAMILY

To this group belongs the sweet gum or *Liquidambar* (so-called from the fragrant sap.). The small greenish flowers are in globular heads or catkins; the fertile flowers cohere and become hardened in fruit, forming a dense spiny ball.

PLANE-TREE FAMILY

Somewhat similar are the fruits of the sycamore or buttonball or plane tree, as it is variously called. The greenish flowers are very small. The fertile ones produce small nutlets, which are aggregated about a hard central core to form the "ball".

ROSE and PEA FAMILIES

These two closely related families (apples, shadblush, hawthorns, cherries, on the one hand; locust, red-bud, etc., among the *Leguminosae*) have large conspicuous flowers which are well known to everybody.

QUASSIA FAMILY

To this family belongs the *Ailanthus*, which is becoming abundant enough in places to appear as a native tree. The small flowers are in greenish panicles.

The pollen-bearing tree especially has a strong odor. Someone has said it is called "Tree of Heaven" because it smells to heaven. Grown in the open, it may become quite a beautiful object (see illustration).

HOLLY FAMILY

All have small white or greenish flowers. Some trees have pollen-bearing flowers only; others seed-bearing flowers.

MAPLE FAMILY

The flowers are often inconspicuous, but in the red maple, for example, they may be decidedly ornamental. The same situation is true in the basswoods (Linden Family).



Red maple flowers

DOGWOOD FAMILY

This includes the dogwoods and the sour gum. The flowers themselves are small, though the surrounding bracts in the flowering dogwood may be conspicuous.

EBONY FAMILY

A large tropical family, which is represented only by the persimmon, which has small greenish-yellow flowers, succeeded by the well-known large orange fruits.

OLIVE FAMILY

To this group belong our ash trees, which are wind-pollinated and have obscure greenish flowers. However, many shrubs or trees with conspicuous flowers —forsythia, lilac, etc.—belong to this family.

HONEYSUCKLE FAMILY

Several species of *Viburnum* become trees. All have numerous small flowers in dense clusters.

COMPOSITE FAMILY

In the tropics many composites (including sunflowers, asters, daisies, etc.) are large trees. With us only the groundsel tree (*Baccharis*) of our salt marshes reaches the status of a shrub or possibly a small tree.

This list includes practically all of our native trees in the northeastern States. As may be seen by running through the list, the great majority are wind-pollinated and are conifers, or catkin-bearing trees which flower early in the spring.





Pine barrens (chiefly *Pinus rigida*), Coram, Long Island

TREES FOR SPECIAL PURPOSES

Charles F. Doney

IN the Spring 1945 issue of PLANTS & GARDENS there appeared an article on "Shrubs for Special Uses." Trees too play an important part in the development and decoration of the landscape and it seems appropriate at this time to follow the shrub article with a similar one on trees. The list is by no means exhaustive but it includes those trees which to the author seem particularly worth mentioning. Here too the plants have been grouped in accordance with the special purposes for which they may be of value.

DRY PLACES

By a dry place we mean an area where, due to rapid drainage or evaporation by the wind, the amount of water in the soil is below the normal requirements of most plants. A few trees, however, are at home in such situations and these, at

times, play an important part in garden planting. The trees in the following list may vary in their endurance of dry conditions but most of them will make satisfactory growth in fairly dry soil.

Acer campestre, HEDGE MAPLE, ENGLISH MAPLE. A compact, rounded tree, or sometimes large shrub, that varies between twenty and forty feet in height. The dark green, five-lobed leaves are about four inches long and often turn yellow before dropping in the fall. It is at home in various soil conditions and because of its bushiness and a tendency to low branching it is sometimes used in large hedges, either sheared or free growing.

A. Ginnala, AMUR MAPLE. Hailing from China and Japan, this maple is a small bushy tree, or large shrub, that averages about fifteen or twenty feet in height. The long-pointed leaves are dark green during the summer but in the fall they color brilliantly. It is easily grown



and very hardy and is suitable as a lawn specimen or as accent in a large shrub border.

Betula populifolia. GRAY BIRCH is an irregular small tree of 20 to 30 ft. and is easily distinguished from the other white-barked birches by the fact that it usually has several trunks rather than a single one. It is found on open hillsides, in poor sterile soil and burned over areas. It is adaptable to wet or dry soils and has considerable ornamental value.

Robinia Pseudoacacia. BLACK LOCUST is a medium sized, fast-growing tree; it is variable in habit but usually has a narrow open crown. In most cases the twigs have a pair of spines at each node. It has pinnate, light green leaves and in late spring the trees are bright with clusters of fragrant, white, pea-like flowers. Under good growing conditions black locust can be a handsome tree but too often it is deformed by borers. Growing in a variety of soils it is suitable mainly to naturalistic plantings; it suckers and seeds freely and can be used to bind sandy soil.

Pinus rigida. PITCH PINE is variable in habit but usually is a medium sized tree, pyramidal while young, becoming coarse and irregular, though often picturesque with age. Yellow-green needles are born in clusters of three and often occur in tufts on the trunk and older branches. While not particularly ornamental it will thrive in poor sandy soil where few, if any, other trees could survive.

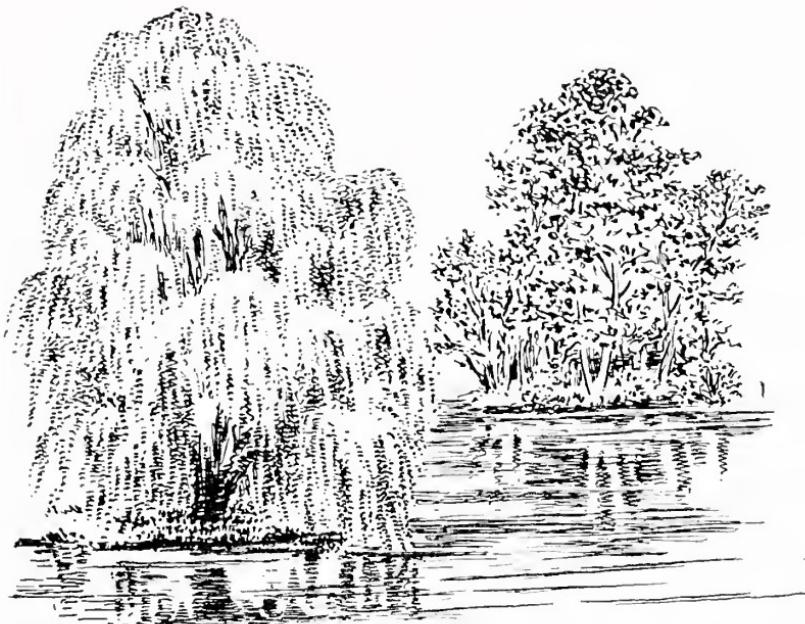
P. Strobus, WHITE PINE. Perhaps the handsomest and most important of eastern conifers, at one time it formed extensive forests in the northeastern States. It is a fast growing tree and often exceeds 100 feet in height; like many other conifers it is symmetrical while young but gradually develops an irregular crown with more or less horizontal branches. Best growth is made in sandy soil but it is fairly tolerant. The slender, flexible needles give the branches a plump appearance; it is widely used in ornamental plantings as specimens or in masses.

P. sylvestris, SCOTCH PINE. A variable species that is widely distributed in Europe where it is an important timber tree. Here it is used in reforestation work and is frequently cultivated. It is irregular and picturesque in habit with gray-green needles and red-brown or orange bark on the upper branches. City life is evidently to its liking and it will stand light sandy soil and exposed situations. It is very handsome when growing but is usually short-lived under our conditions.

Quercus borealis var. *maxima*, RED OAK. A fast-growing long-lived tree at home on sandy loam soils. With ample room it develops a broad spreading head but in the forest it has a tall trunk and small round head. The lustrous dark green foliage turns red and bronze in the fall. It is easily transplanted and is adaptable to various soils: a popular street tree.

WET SOIL

A wet soil is one in which, due to poor drainage or a high water table, there is more water than most plants find congenial; the borders of swamps or bogs or the banks of streams or areas where water stands for a considerable time after rains are typical. The following trees are valuable for planting in such situations.



Acer rubrum. RED MAPLE is widely distributed over the country, particularly in moist places. It is a medium-sized tree with upright and spreading branches that often form a rounded head. Its bright red flowers are conspicuous in the early spring landscape and in the fall the leaves turn brilliant scarlet. On young trees the bark is smooth and gray. It resembles the silver maple but is superior for landscape purposes.

Betula lutea, YELLOW BIRCH. A valuable timber tree of rich moist woodlands that is readily recognized by the silvery-yellow bark that peels off in thin curls. It is larger than the black birch, sometimes growing 100 ft. high.

B. nigra, RIVER BIRCH, RED BIRCH. A medium sized tree of 50 ft. or more that is common along stream banks and in moist places. It grows farther south than any other American birch. The red-brown bark peels off in large layers and gives the tree a very picturesque appearance. Slender and irregular in form, river birch is a desirable ornamental and often grows well in fairly dry soil.

Larix laricina. AMERICAN LARCH or TAMARACK is of pyramidal habit and grows to 70 or 80 ft. The bright green needle-like leaves turn yellow before dropping in the fall; it is one of the few members of the pine family that sheds all its needles each year. It grows far north and occurs frequently in swamps and wet places.

Nyssa sylvatica, TUPELO, SOUR GUM, PEPPERIDGE. This tree of swamps and moist places grows to about 60 feet and has a narrow open crown. The branches have a horizontal tendency and as the trees mature they become quite picturesque. During the summer the leaves are lustrous dark green but early in the fall they turn scarlet and make a spectacular display. One of the most colorful of our native trees it is seldom seen in cultivation because so difficult to transplant.

Platanus occidentalis, SYCAMORE, BUTTONWOOD. Along with the tulip tree this is one of the largest of eastern hardwoods, not uncommonly exceeding 100 ft. in height. A tree of bottom lands and moist places it is readily distinguished

by the white and brown mottled bark; the brown outer bark peels off and exposes the pale inner bark. Another interesting feature is the ball-like heads of fruit that hang singly on a slender stem over most of the winter. Primarily a tree for naturalistic plantings in moist soil.

It is the London plane-tree (*P. acerifolia*), a probable hybrid form, that is frequently planted on city streets. It resembles sycamore in general appearance but the fruit heads are borne in twos and the bark is olive green; it is considerably more adaptable to city life.

Quercus bicolor. SWAMP WHITE OAK is a medium sized tree of swamps and wet places. With age it becomes irregular in outline with somewhat picturesque, twisted branches; on young limbs the bark peels off in papery flakes. It is useful mainly in naturalistic plantings in moist soil.

Q. palustris, PIN OAK. In winter the broadly pyramidal outline of the pin oak together with the drooping lower branches and more or less horizontal middle ones makes it easily recognized. It has relatively small leaves that are deeply lobed and turn bronze in the autumn. Typically a tree of moist soil it is able to get along under the dry and smoky conditions of the city. It is primarily adapted to lawn and park planting; although often recommended as a street tree the drooping lower branches are a nuisance unless the trees are pruned high to begin with and even then they may require regular pruning.

Salix spp. THE WILLOWS in general are moisture loving trees, many of them growing along the banks of streams and water courses; they will, however, succeed in drier situations. There are many kinds in cultivation where they are used as specimen trees and beside ponds and streams.

The weeping forms, as typified by the Babylon weeping willow (*S. babylonica*) with its narrow leaves and long, slender, pendulous branches, are the most popular. Other, and better, kinds are Wisconsin weeping willow (*S. blanda*), Niobe wil-

low (*S. Niobe*) and Thurlow weeping willow (*S. elegantissima*).

Taxodium distichum, BALD CYPRESS.

The tree that forms the peculiar cypress swamps of the southern States; there it may exceed 100 feet in height and becomes flat-topped with age. In northern gardens however it does not reach that height and is usually narrow-pyramidal in shape with feathery, light green foliage. The short, lateral twigs are shed in the fall along with the small, needle-like leaves. Not an important ornamental tree in the north, but interesting, and grows well beside streams and ponds.

Tilia americana. AMERICAN LINDEN or BASSWOOD is a dense, rounded tree of approximately 70 feet with dark green, heart-shaped leaves. Clusters of yellowish flowers are borne in June on slender stalks to which is attached a wing-like bract; this wing helps in scattering the seeds. Though not conspicuous the flowers are sweetly scented and their fragrance often pervades the area about the tree; bees are very fond of the nectar; in fact, this linden is sometimes called bee-tree. It is an important timber tree and is sometimes used along streets but it is not adapted to this use for it wants deep moist soil and is not happy in dry situations.

Ulmus americana, AMERICAN ELM. This is probably the best known and most widely admired of our native trees. By its "vase" form it can be readily recognized from a distance. It is variable in habit but usually, under good conditions, it has a straight trunk that divides into several large arching limbs with drooping branchlets that form a wide-spreading crown of great beauty. While preferring deep, moist soil it will adapt itself to drier conditions if the air is clean; the soot and gas of the city have an inhibiting effect and for this reason it is not a good tree for city streets. It is a beautiful tree for parks and large lawns. Susceptibility to elm leaf beetle and the Dutch elm disease may make its planting impractical.

SEASHORE

The seashore has severe growing conditions. It is usually sandy and therefore a place of rapid drainage of fresh water. Salt water, which is poisonous to most kinds of plants, is only a relatively short distance down. Almost constant breezes cause rapid evaporation of moisture from leaf surfaces, strong winter winds and salt spray have an injurious effect that few plants can tolerate. Following are a few trees that can withstand seashore conditions.

Betula papyrifera, PAPER BIRCH, WHITE BIRCH. Typically a tree of northern North America; it is found in the northern States in mountainous regions or where the climate is cool and moist. A beautiful and graceful tree widely admired for its chalky white bark; the Indians used the bark to cover their canoes and it is now used for novelties; once the white bark is removed it is not renewed. As a lawn tree it is particularly effective against dark evergreens. It is not a useful tree for the gardener except in the north.

Fraxinus excelsior, EUROPEAN ASH. In Europe a valuable timber tree and frequently used as an ornamental. It is not

so satisfactory here but under good conditions it makes a handsome oval-topped specimen; not a good street tree.

Hippophaë rhamnoides. SEA BUCKTHORN is sometimes a small tree but more often a suckering, sprawling shrub. It is planted for its narrow silvery-gray leaves and the orange fruits of the female plant, but particularly for its tolerance of poor sandy soil and seashore conditions.

Quercus stellata, POST OAK. A medium sized tree rarely more than 60 feet in height. Roughly cross-shaped in outline, the shining, leathery leaves are dark green above and covered with yellowish hairs on the under side. Though of pleasing appearance it is not particularly ornamental and is valued more for its ability to thrive in poor soil.

As far north as Cape Cod, American holly (*Ilex opaca*) is to be found growing both in sheltered and in exposed situations. Our native red cedar (*Juniperus virginiana*) is to be seen along the coast as well as inland. Along the Maine coast white spruce and red spruce are frequently found at the water's edge.

Other trees for the Seashore are: *Pinus nigra*, *P. Thunbergii* (see under "Screen Plantings"), *Sassafras albidum* (see "Winter Interest").





VERY COLD CLIMATES

In areas where the temperature drops very low in the winter time, as in the northwestern States and New England it is often difficult to find trees that will survive. Those listed below are generally quite hardy.

***Abies balsamea*, BALSAM FIR.** A handsome, symmetrical tree of medium size with dark green needles and of narrow pyramidal habit. It is at home in the north woods and loves the clean, cool moist air of mountainous regions; it will not thrive in hot, dry areas. Growing as far north as southern Labrador it is also found in parts of New York and Pennsylvania and in the Appalachians of Virginia and West Virginia. It is our most popular Christmas tree.

***Acer Negundo*, Box ELDER or ASH-LEAVED MAPLE** is one of the commonest maples. It is found in most of the States and is the only American species with pinnate leaves. Generally of medium size it has stout glaucous twigs that are green or purple. While not a particularly handsome tree it is valued for its rapid growth and ability to survive under adverse growing conditions. It should not be planted if better species can survive. There are variegated and cut-leaved forms.

***A. saccharinum*, SILVER MAPLE.** A fast growing tree that likes moist soil. It is somewhat like red maple but is more irregular in habit with pendulous branchlets that turn up at the tips. It is handsome and graceful while young but matures quickly; the branches break easily in storms and therefore it should be planted with caution and never along

streets. It has been much overplanted but on low meadow lands will sometimes make a specimen as handsome and graceful as any elm. It is also useful for quick temporary screens.

***A. saccharum*, SUGAR MAPLE.** Where growing conditions are to its liking this is the most desirable of the American maples. It is dense and symmetrical in habit with a rounded or oval head; the wood is hard and strong and the trees are relatively long-lived. It loves rich, moist soil and clean air, and the smoky air and poor soil of the city are usually too much for it. As a timber tree it is of considerable importance and it is also valued as the source of maple sugar and syrup.

***Betula lenta*, BLACK BIRCH, CHERRY BIRCH.** A common tree in rich moist woodlands. It is of medium size (50-60 ft.) and young trees have the reddish brown or black bark of the cherry. The twigs and bark have been a commercial source of oil of wintergreen. Though without attractive flowers or fruits it is an interesting and graceful tree well worth cultivating.

***Quercus macrocarpa*. BURR OAK or Mossy-CUP OAK** is a hardy, long-lived tree that suggests the white oak with its short trunk and broad, rounded head. The dark green leaves are almost cut in half by two deep indentations; conspicuous corky ridges are often found on the twigs; and the acorns are large, sometimes two inches across, with a deeply fringed cup. Burr oak is usually found in moist soil but in cultivation it will grow in average to dry soils.

MILD CLIMATES

Albizia julibrissin, SILK TREE. Greatly planted in the southern States. Not dependably hardy as far north as New York City but sometimes seen in sheltered places. It is a rapid grower with large fern-like leaves composed of numerous small leaflets. For many weeks during the summer, from the end of June to early September, heads of pink flowers are produced. They are made conspicuous by the long silky stamens. The variety *rosea* has deeper flowers. It is not so tall growing and is probably hardier.

Cedrus Deodara, DEODAR. This is the famous great evergreen tree of the Himalayas which flourishes in our southern States and in California. It is not reliably hardy north of Baltimore although good specimens are occasionally seen. It is closely related to the cedar of Lebanon and to the Atlas cedar, both of which are slightly hardier but still not to be recommended for conditions of the middle States. In mild climates all of them are quick growing and form magnificent specimens.

Ilex Aquifolium, ENGLISH HOLLY. This magnificent evergreen tree will grow to forty feet in mild climates, south of Washington or Norfolk and on the

Pacific coast. It is a native of Europe and Asia and has beautiful shining foliage, even more decorative than that of our American holly. In the Puget Sound region it is grown commercially to cut for Christmas wreaths and its use for this purpose certainly should be encouraged to prevent the destruction of our wild holly.

Magnolia grandiflora, BULL BAY. This noble evergreen tree will grow as high as 100 feet in our southern States, where it is native from North Carolina to Florida and Texas. Its large evergreen leaves give the tree great beauty but are also a drawback as they keep falling throughout the year. The tree is widely planted in Washington and even Baltimore, but from there north it is seldom seen, and even where it survives the winter the foliage is badly burned by the winter sun.

Melia Azedarach, CHINA-BERRY, CHINA TREE, PRIDE OF INDIA. This Asiatic tree has been much planted in warm climates and is naturalized in tropical regions around the world. It is a splendid tree, growing to 50 feet, and is much seen in our southern States.

Paulownia tomentosa, EMPRESS TREE. This Chinese tree, named for Princess Anna Paulowna of the Netherlands, has

Flowers and foliage of silk tree



escaped from cultivation in our southern States and is occasionally seen around Philadelphia or New York in sheltered places. It will grow to 50 or more feet in height and its pale violet flowers make it a magnificent sight in the spring. The flower buds and the seed pods both give the tree a striking effect in the winter months. In general effect the tree is much like the catalpa and is often mistaken for it. It is a tremendously rapid grower when young. South of Philadelphia self-sown seedlings may grow as much as 8 or 10 feet during the first year.

Quercus nigra (aquatica), WATER OAK. This magnificent tree grows wild from Delaware to Florida and Texas and attains a height of 80 feet. It is deciduous in the north and the leaves become more persistent as it reaches the southern limit. For mild climates this is one of the most beautiful and graceful of all oaks.

SCREEN PLANTINGS

In the home landscape it is frequently desirable or necessary to block off buildings or views that may be objectionable or to enclose certain areas for privacy or protection. Fences and trellises may be used for this purpose but a far better effect is obtained from the use of trees and shrubs. The trees listed below have proved satisfactory in screen plantings.

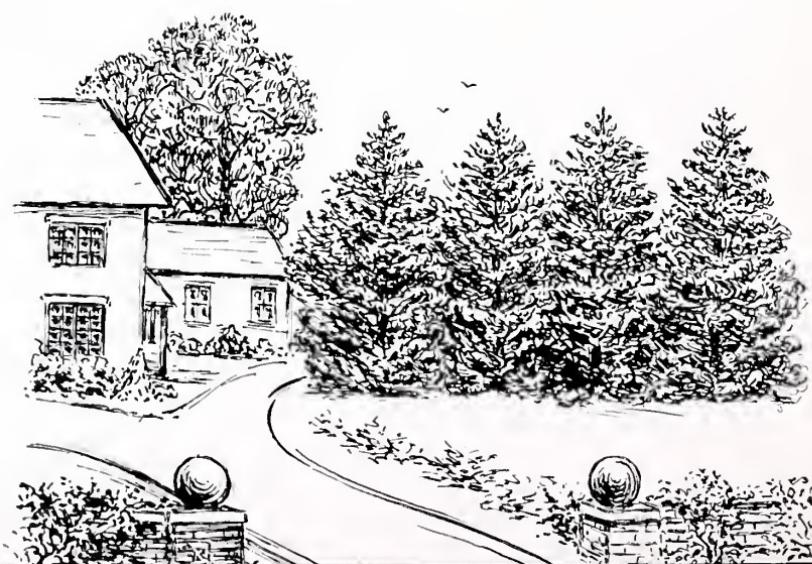
Abies concolor. WHITE FIR or COLORADO FIR is a native of the western States. Though it is beautiful in form and foliage a large part of its popularity is due to its adaptability to the soil and climate of eastern gardens. White fir is of fairly rapid growth and though conical while young it does not have the sharp regularity of many firs and spruces. The needles are two to three inches long and vary from gray-green to silvery blue.

Juniperus virginiana, RED CEDAR. A small to medium sized tree of narrow pyramidal or columnar habit. Good soil does not seem important to it for it is commonly found in poor dry soil, in old fields and waste places; full sun, however, is important to its best development. The dark blue berry-like fruit is ornamental and is relished by birds. Red cedar has many varieties that differ in habit and foliage color.

J. virginiana var. *Burkii* is compact in habit with steel-blue foliage.

J. virginiana var. *Canaertii*. A narrow form with dark green foliage.

Pinus nigra, AUSTRIAN PINE. This is a small to medium sized tree that is pyramidal or broadly oval in shape; it becomes irregular and flat-topped with age. The needles are 4 to 6 inches long, dark green in color and stiff and sharp. In landscape work it is popular because



of its tolerance of city conditions and a variety of soils; it is used as a specimen or as screen or mass plantings.

P. Thunbergii, JAPANESE BLACK PINE. Growing to 100 feet or more under favorable conditions, it is of irregular habit and has bright green needles. In young stages it resembles Austrian pine but is not so compact. It thrives at the seashore, particularly in exposed windy places.

Populus nigra var. *italica*, LOMBARDY POPLAR. A familiar and handsome tree of narrow columnar form. It is easily propagated and makes rapid growth under ordinary conditions. In tall screen plantings, where a quick effect is desired, it is splendid and it is also good as an accent tree. Its roots spread widely and may be troublesome in small gardens; in common with other poplars its roots have a tendency to enter and obstruct sewers.

Rhamnus cathartica, BUCKTHORN. Though usually seen as a large shrub, buckthorn in time may develop into a small round-topped tree of 20 feet or so. The oval leaves are shining dark green and the female plants bear black berries, but buckthorn has little ornamental value; it is used mainly for screen plantings or large hedges under difficult conditions.

Thuya occidentalis, ARBOR-VITAE. A common and useful evergreen, variable in habit but usually forming a narrow pyramid. It is very hardy and develops best in fertile, well drained soil though it naturally grows in swampy places. It does not like hot, dry situations where it tends to turn brown in the winter. In the home landscape it has various uses, such as specimens, screens and hedges. There are many garden forms.

Tsuga canadensis, CANADA HEMLOCK. A graceful, fine-foliaged tree that may exceed 100 feet. It is an important timber tree and, because young specimens are

attractive and decorative, it is becoming increasingly popular in ornamental plantings. By preference it is a tree of cool, moist, shaded places but it is fairly flexible in its requirements and will stand full sun if in a cool protected place. In the home landscape it can be put to several uses; it makes a beautiful specimen and a splendid tall screen, and with thoughtful handling will form an uncommonly handsome tall hedge.

There are a great many garden forms of hemlock that vary in foliage and habit. The best known is var. *pendula*, Sargent's weeping hemlock, which has pendulous branchlets and forms a broad, flat-topped bushy mass.

T. caroliniana. CAROLINA HEMLOCK continues to gain favor. In general it resembles the northern hemlock but it is a bit more graceful and compact. It is given a somewhat different aspect by the dark green, lustrous needles that spread from the twigs in all directions, rather than appearing in two flat rows as in Canada hemlock, and as it becomes better known it may surpass it in popularity. It too likes cool moist situations and well drained acid soil.

Viburnum Sieboldii. SIEBOLD VIBURNUM, though usually seen as a vigorous large shrub, will become in time a handsome small tree to 20 feet or more, well clothed with large, lustrous dark green leaves. In the spring it bears flat clusters of yellowish flowers and these are followed by berries that are pink at first, then red and finally blue-black. The berries are taken by birds or soon fall but their bright red stalks persist for some time and are a decorative feature. Siebold viburnum can be used in mass plantings, for height in a large shrub border, or as a tall screen.

CONSPICUOUS FLOWERING TREES

Aesculus carnea, RED HORSE-CHESTNUT. A very ornamental tree that resembles the common horse-chestnut in most characteristics except the color of the flowers which vary from pink to red. Though more tolerant than common horse-chestnut it is still not a tree for hot, dry situations. The variety *Briotii* has bright scarlet flowers.

Crataegus Oxyacantha, ENGLISH HAWTHORN. A small, dense tree of 15 to 20 ft. with stiff branches and small spines. Deeply lobed are the small leaves; in May the trees are adorned with clusters of white flowers and the decorative red fruit ripens in early fall. Useful as a lawn specimen, for accent in large borders or as a tall hedge, sheared or free growing.

Paul's English hawthorn has double deep pink flowers and is spectacular in full bloom.

Davidia involucrata. DOVE TREE is a medium sized tree of comparative rarity in American gardens. Two large white bracts are at the base of each flower head and these are the ornamental features of the tree. China is its home and there it is said to be spectacular in bloom, but here the bracts are often sparse and poorly colored and the tree has little garden value. On two or three occasions it has suffered winter injury in Brooklyn.

Franklinia (Gordonia) alatamaha. FRANKLINIA was first discovered in Georgia about 1770 but it has not been found growing wild there since 1795. It is a tall shrub or narrow, bushy tree to 15 feet or so in northern gardens, with narrow glossy green leaves that the first touch of fall turns glowing red and orange. Golden stamens brighten the cup-shaped white flowers that open in September and October. Grows best in moist, rich soil and a place where it is protected from the wind.

Halesia carolina (tetrapetra), SILVERBELL. A small tree, often shrubby, to 15 or 20 feet. In early spring, before the leaves are developed, the bare branches are decked with clusters of white bell-shaped flowers. Silverbell prefers moist, cool situations and is effective in large borders or as a specimen with an evergreen background.

Maackia amurensis is only infrequently used in our plantings but it is a distinctive small tree that merits wider use. It is one of the few trees that blooms in July; the small, dull-white pea-shaped flowers are carried in branched erect clusters and are effective for about two weeks. Maackia has a somewhat Oriental effect, both in summer and winter. It is slow growing; a tree in the Brooklyn Botanic Garden, about 30 years old, is now 15 ft. high.

Magnolia virginiana (glaucia), SWEET BAY, SWAMP MAGNOLIA. Grows in wet places naturally, but adapts itself to ordinary garden conditions. Its fragrant white flowers come during June and July, and birds are very fond of the red seeds that emerge from the cone-like fruit in the fall. It is often seen as a large shrub, but becomes in time a medium-sized tree.

Stewartia ovata (pentagyna). A slow-growing, bushy small tree that seldom exceeds 15 feet in height. Rich green foliage provides a good foil for the broad, white, golden stamened flowers that open from late June to August. Stewartias like rich, moist soil and grow better where they are not exposed to the wind; they are best used as specimen plants.

The variety *grandiflora* has larger flowers with purple stamens.

Other flowering trees are: *Albizzia*, *Cladrastis*, *Cornus florida*, *Crataegus*, *Magnolia grandiflora*, *Malus spp.*, *Oxyacantha*, *Oxydendrum*, *Paulownia*, and *Robinia Pseudoacacia*, described elsewhere in this issue.

AUTUMN & WINTER INTEREST

The majority of trees and shrubs commonly seen in landscape plantings are bright with flowers in the spring or early summer but contribute little to the picture in autumn and winter. There are, however, many shrubs and small trees that can be depended upon to add color and attractiveness to the fall and winter scene with their bright berries or foliage and interesting branching habit. The following trees are recommended for this purpose.

Conspicuous Fruit

Cornus alternifolia. PAGODA Dogwood is distinguished from other American dogwoods by its alternate, rather than opposite leaves. It is a small tree, or sometimes large shrub, of about 20 ft. The branches are arranged in horizontal tiers and make a very interesting winter picture. Yellowish-white flowers are followed by blue fruits on red stems and the leaves turn dull purple in the fall.

C. florida, FLOWERING DOGWOOD. A familiar small tree of moist woodlands. It grows to 20 ft. or more and makes a striking display in the spring when the spreading horizontal branches are decked with large white "flowers." In the fall the foliage colors brilliantly and the bright red berries are most attractive.

Variety *rubra* has attractive pink flowers.

Crataegus Phænopyrum (cordata), WASHINGTON THORN. Of the seemingly endless kinds of American hawthorns this species is distinct and well worth cultivating. Though variable in habit it generally develops a dense ovate or pyramidal head of slender long-spined branches. During the summer its leaves are glossy dark green but in the fall they turn brilliant scarlet. The clusters of small fruits ripen to shiny scarlet and last through most of the winter.

Euonymus Bungeana, SPINDLE TREE. A small rounded tree to 15 or 20 ft. with slender arching branches. The greenish-

yellow flowers are not attractive but in the fall the branches are weighed down with the peculiar pink fruits. Unfortunately subject to scale insects.

Malus species. A large group of small trees that are becoming increasingly popular because of their profuse bloom in the spring and the showy autumn fruits of certain kinds. They are easily grown and thrive in any reasonably good soil. Among the species with decorative fruit are *M. Arnoldiana*, *M. baccata*, *M. floribunda*, *M. pumila* var. *Niedzwetzkyana*, *M. Schiedeckeri*, *M. Sieboldii* and *M. toringoides*.

Sorbus americana, MOUNTAIN ASH. A small, slender tree that is found on rocky hillsides, particularly in the north country. Flat clusters of small white flowers are borne in late spring and these are followed in late August or September by very showy orange-red berries. Mountain ash makes an interesting specimen on small properties; it prefers moist soil and is subject to various insect pests.

European mountain ash or Rowan tree (*S. aucuparia*) is very much like the American species but has slightly larger fruits and seems more adaptable to general cultivation.

Conspicuous Red Foliage

Liquidambar Styraciflua, SWEET GUM. A handsome large gray-barked tree of symmetrical habit to 100 feet or more; it is typical of southern forests, and is an important timber tree. The leaves are star-shaped and turn rich shades of yellow, purple and red. Odd corky wings or outgrowths occur on the twigs. The fruit is a long-stalked round head made up of spiny capsules. Deep, moist soil suits it best and it is hardy to southern New York and Connecticut.

Quercus coccinea, SCARLET OAK. A hardy, rapid-growing tree to about 75 feet that is generally found on dry sandy soils. The deeply lobed, shiny leaves turn bright red and scarlet in the fall, possibly the brightest of the oaks. It is a desirable ornamental tree.

Conspicuous Yellow Foliage

Cladrastis lutea, YELLOW WOOD. An uncommon small to medium-sized tree from the southeastern States; its smooth, gray bark is suggestive of beech. In May fragrant white pea-like flowers are borne in pendulous clusters. During the summer the pinnate leaves are bright green but they turn clear yellow in the fall. Makes an interesting small shade tree or lawn specimen.

Fagus grandifolia. AMERICAN BEECH is one of the outstanding trees of our forests. It is a large tree, 60 to 80 ft., with wide spreading branches and smooth gray bark. Oval and sharply toothed, the leaves turn clear yellow in the fall; often they persist into the winter. It makes an excellent specimen on large lawns and is sometimes used for tall hedges.

Ginkgo biloba, MAIDENHAIR TREE. A rather unique Asiatic tree. In young stages it is variable in habit and branches erratically but with age it assumes its typical broad-pyramidal shape. The fan-shaped leathery leaves turn clear yellow in the fall. There are male and female trees, and only the male should be planted for the female develops yellow cherry-like fruits that fall about and have an offensive odor. It is an exceedingly handsome tree with few, if any, pests, requires no particular care and is amenable to city life. On a large lawn it makes a fine specimen and it is sometimes used along broad streets.

Liriodendron Tulipifera, TULIP TREE. A very distinct and handsome tree; it is one of our tallest forest trees, often exceeding 100 feet, and a valuable source of timber. The common name derives from the greenish-yellow flowers that resemble tulips. In the fall the oddly shaped leaves turn clear yellow. Best development is made in deep, moist but well-drained soils. Transplanting should be done in the spring with care.

Winter Interest

Gleditsia triacanthos, HONEY LOCUST. A medium sized tree to 70 or 80 feet or more with a rounded or somewhat flattened open top and zig-zag spreading branches. Though the leaves are large they are twice pinnate and made up of many small leaflets which impart a feathery appearance; the leaves turn yellow in the fall. The flowers are inconspicuous but the long, red-brown, curled pods often last into the winter and always attract attention. Clusters of long, formidable, branched spines stud the trunk. It is hardy and adaptable to a variety of soils. Because of the light shade it casts it is a good street tree and when so used the variety *incrmis* is better, for it has no thorns.

Oxydendrum arboreum, SOUR-WOOD. Inhabiting rich woods from Pennsylvania southward this little tree has considerable garden value. It averages around 20 feet in height and has shiny oblong leaves that turn scarlet in the fall. Branched clusters of small white flowers adorn the trees in July. Like most plants in the heath family it wants an acid soil.

Sassafras albidum (officinale) (varii-folium), SASSAFRAS. This is a distinctive small suckering tree common along roads and hedgerows. In outline it is irregular or oval with short, somewhat horizontal branches that tend to turn up at the tips. Green, pleasant-tasting, aromatic bark covers the twigs and three different types of foliage are produced, often on the same branches. In the fall the leaves turn brilliant shades of red, yellow and orange. Female trees bear attractive clusters of red-stemmed, dark blue berries. Sassafras has fleshy roots which make it difficult to transplant; only small sizes should be moved and these in the spring.

Other trees interesting in the winter are: *Cornus florida*, *Fagus grandifolia*, and *Nyssa sylvatica*, described elsewhere in this article.

TREES FOR LAWN AND GARDEN

Henry E. Downer

TREES, being the largest and longest-lived plants, should be given careful thought as to their selection and their placement in the garden and landscape picture. There is a deep-rooted and widespread feeling of sentiment for trees in general; but as individuals many good trees are not as well known as they deserve to be.

Planting primarily for shade may be the chief consideration; but form, longevity, and foliage, flower, and fruit values are other important factors that should be given thought before final selection is made. Look around well and try to visualize the tree in its mature state, before digging the hole for planting.

Like all living things, trees are subject to various ills and misfortunes. Not so long ago trees were left pretty much on

their own until they died or were storm-wrecked; but today there is a better understanding of corrective and curative treatments. A tree can be well started by proper placement and careful transplanting. But during the years attention should be given to any pruning that may be required to correct faults; to feeding and watering as necessary to maintain the tree in good health; and to protecting from pests.

Evergreens

Coniferous evergreens play an important part in the landscape, especially in those parts where deciduous trees are bare for a good part of the year. There is much to be learned from the tree plantings of years ago. In many parts of the eastern States the exotic Norway spruce is to be seen in various stages of decline. This fast-growing tree, shapely in its

The oldest dogwood tree in Valley Forge Park; about 100 years old

Courtesy Adolf Muller, DeKalb Nurseries



early years, generally loses much of its beauty after 50 years or so. Where that particular form of growth is desired, many more decades of beauty can be expected from the Douglas fir, the handsome tree from the west with the contradictory name of *Pseudotsuga taxifolia*. The Rocky Mountain form grows well in the eastern States. The Colorado white fir (*Abies concolor*) is superior to the more widely planted Colorado blue spruce, being less stiff in form and to the touch.

Another good fir is the Nikko fir (*Abies homolepis*), a native of Japan. It is hardy and shapely, and has lustrous dark green leaves conspicuous with silvery bands on the under side. Firs need fresh air and sunlight in order to thrive, and good soil that does not dry out quickly. The common hemlock grows into a graceful tree, but the more compact Carolina hemlock (*Tsuga caroliniana*) is perhaps even more attractive. It has been growing long enough in New England to prove its hardiness and its beauty as a lawn specimen, and has been recommended for city gardens. Several pines grow into handsome specimens where space permits. One of the most unusual is the lacebark pine (*Pinus Bungeana*), so called because of the exfoliating bark which gives the

trunks a mottled effect. It is slow-growing, bushy at first, with usually several trunks developing, and distinctive with light green leaves. The native arbor-vitae grows into a picturesque specimen when well placed, but is not so attractive in appearance as the western arbor-vitae (*Thuja plicata*), the Rocky Mountain form of which grows well in the East. Of outstanding appearance is the Japanese umbrella-pine (*Sciadopitys verticillata*), so called from the parasol-like arrangement of its dark green glossy leaves. In cultivation it is slow-growing, and of dense pyramidal habit for many years.

Broad-leaved evergreen trees may be represented only by American holly (*Ilex opaca*) in northern gardens, where a good specimen is outstanding. Given cool moist soil on the acid side, and a sunny but sheltered location within the coastal region, some of the selected forms will eventually grow into handsome specimens.

Deciduous Trees

When thinking of deciduous trees, one cannot overlook the native dogwood (*Cornus florida*). While a tree of only modest proportions, it is outstanding in attractiveness throughout the year: beautiful

Washington thorn, a splendid hawthorn with shiny red fruit and bright autumn foliage



in spring in a good season, and spectacular in the fall with richly colored foliage and brilliant red berries. A newer introduction of great promise is the Chinese dogwood (*Cornus Kousa* var. *chinensis*). The pointed creamy-white floral bracts appear in June well after the leaves, and the fleshy pinkish fruits ripen in late summer, looking somewhat like strawberries. A popular and small tree showy in bloom is the double-flowered form of English hawthorn (*Crataegus Oxyacantha*), known as Paul's scarlet. Less showy in bloom, but with extra attractions, is the native Washington thorn (*Crataegus Phacnopyrum*, better known as *C. cordata*). The white flowers open in June; and color comes in the fall when the leaves turn orange and scarlet, and the berries turn scarlet to remain colorful well into winter. It makes a good-looking tree to about 30 feet high, and is better-natured about transplanting than most thorns.

The yellow-wood (*Cladrastis lutea*) is a southern beauty that grows well in northern gardens. It is a medium-sized tree of good appearance the year round, especially in June when the pendant clusters of fragrant white flowers are open. The large pinnate leaves turn yellow in the fall. The varnish-tree of China (*Koelreuteria paniculata*) is a mid-summer-flowering tree of distinctive appearance, seldom over 30 feet high. It has bright green pinnate leaves of good size; and it bears large erect panicles of yellow flowers, followed by conspicuous inflated seed pods. Another mid-summer-flowering tree is the native sorrel-tree (*Oxydendrum arboreum*), also usually not over 30 feet high. It prefers a somewhat moist and acid soil, like most other members of the heath family. The small white flowers are displayed in drooping loose panicles, and the glossy green leaves turn to brilliant scarlet before falling. In late summer the Japanese pagoda-tree (*Sophora japonica*), so called in spite of being a native of China, attracts attention with its

clusters of creamy-white flowers. The pinnate leaves are held green well into the fall. It is a very hardy tree, growing to 60 or more feet high; and like most members of the pea family, it thrives on dry soil.

Not all good ornamental trees bear showy flowers or fruits; but shapely form and fine foliage are always attractive. The katsura-tree (*Cercidiphyllum japonicum*) grows into a moderate-sized specimen of distinctive form because of the several trunks it makes just above the ground line. The leaves are pretty with purplish tints when opening, and close the season with yellow and scarlet shadings. Beeches make handsome specimens, especially the European beech (*Fagus sylvatica*) and its purple and fern-leaved forms. Very good-looking is the native sweet gum (*Liquidambar Styraciflua*), which grows rather slowly from a pyramidal form into a large rounded specimen. A peculiar feature is the corky projections on some of the branches, more evident on some trees than on others. The star-shaped glossy leaves turn deep crimson in fall. Sour gum (*Nyssa sylvatica*) is another native tree that ends the season in a blaze of glory. It is slow-growing, and does not take kindly to transplanting unless it is moved with a good ball of soil. Both sweet and sour gums prefer moist soil.

Oaks stand for sturdiness and long life. They have not been so freely planted as some other trees, possibly because of the reputation they have for slow growth. This reputation is not deserved by the pin oak (*Quercus palustris*) after it once becomes established, nor by the somewhat similar scarlet oak (*Q. coccinea*). Both make excellent specimens, the pin oak of pyramidal outline with lower branches reaching downward; the scarlet oak growing into a rounded head, often of irregular form. The latter is one of the best trees to plant on dry soil, and usually justifies its common name in the fall.

NUT TREES

John W. Hershey

MORE and more people are beginning to be interested in trees which are not only ornamental and long-lived, but which have a further usefulness in supplying food for birds, squirrels, and man himself. Among trees for such plantings nothing stands out quite like the monarchs of America's virgin forests, the nut trees.

To this natural collection has been added the English walnut (*Juglans regia*); its nuts have been classed for centuries as royal gifts, by kings; and as God's gift to man, by the poor, for their bounteous production of hermetically sealed potent food value. The English walnut, probably the best known and most popular of the nuts, was brought and planted by all European immigrants. The nuts were known locally by the country from which they came, French, German, Dutch, or English; but the English seemed the most popular. More truly they might be called Persian; for it is from Persia that the fine selections spread over the world, from China to western Europe; from northern Africa to Poland and southern Russia; then on to the Americas. Grafting and budding of nut trees was not considered too much of a chore in southern Europe, but until recently these operations were not attempted in America.

The thrifty pioneer of America quickly learned to know and use the native nut trees: the black walnut; the butternut; and the hickories, especially the shagbark or eastern shellbark (*Carya ovata*) but also the western shellbark (*C. laciniosa*) found in the Mississippi River basin, and the pecan of the mid-west and south.

As people began to ornament their homes and estates, two obstacles prevented them from progressing with the

nuts. One was the difficulty of transplanting nut trees. Hence grew the popular belief, "nut trees won't transplant." This has been, to this day, one of the biggest obstacles in the pathway of making this group of trees popular. The other was the failure to propagate, bud, or graft fine selections of easy-cracking nuts. The late J. F. Jones, father of successful propagation of thick-barked species, overcame this obstacle in his pioneer nut nurseries at Lancaster, Pa., and offered his first trees for sale, I believe, about 1917. Since that time the Northern Nut Growers Association has been holding contests for better nuts every few years and a number of extra fine ones have been found.

Popular Varieties

The marked progress in developing fine varieties of easy-cracking American black walnuts, hardy pecans that will ripen their nuts as far north as Connecticut and north-central Pennsylvania, thin-shelled shagbarks, and hicans (a cross between the pecan and shellbark), has opened the way for people to enjoy wonderful nuts from ornamental plantings, be it on a large estate, a home lawn, or a farm. Added to this, marked and startling progress has been made in locating varieties (clons) of the English walnut. Until recently most of the English walnuts were so temperamental that they were quite discouraging. They did not grow well and were often winter-killed. Added to these improvements came the filberts from Europe. They are a pride and joy to many homeowners, in their unique growth of bush, blossoms, and nuts. With the butternut no progress has really been made in locating fine selections of thin-shelled varieties. Worse yet, hardly anyone has learned how to get a graft to grow, and so the best that can

be offered in these are select seedlings. Next to reach America was the Chinese chestnut, to take the place of the dear old American chestnut. This is not a timber tree, as it is low growing, like an old apple; but it does bear a fine sweet nut, like the American only somewhat larger.

Habit and Foliage

The American black walnut is one of the finest for distant plantings, in meadows or fence rows on the farm, or at the far end of the lawn of an estate. Close to the house it is dirty and messy in nut-falling season; the nuts land on the roof like a ton of bricks. The English walnut with its lighter husk is much more desirable for small places and for hanging over houses. The pecan, hican, and shagbarks, are excellent for planting either on small lawns or on larger places. The filberts, which make bushes 18 to 20 feet high, are excellent for lawn specimens or for informal hedges, planted 8 feet apart. The Chinese chestnut is a beautiful small tree with deep rich glossy foliage, and large burs hanging on over the summer.

Many people are eager for early spring foliage, and of course this is desirable in many places. But next to a house a tree that starts late, permitting the early spring sun to warm things up in the morning, is really better; in the same way its characteristic habit of dropping its leaves early in the fall lets the sun in on early fall days and helps keep the house warm before the furnace is started. All nut trees are thin-foliaged and make light shade in the summer; and so they permit flowers, vegetables, and lawn to be grown under them. Their habit of deep rooting prevents injury to walls, drains, and concrete walks.

All nut trees except the filbert and the chestnut have compound leaves. The leaves of the hickories vary in color; but those of the shagbarks are a dull green, turning to brown in autumn. Shagbarks are narrow-columned growers,

with the short limbs coming horizontally from the trunk, except *Carya ovata pubescens* in the south, which is a spreading grower. The western shellbark is a wide-spreading monarch, with limbs growing from the trunk at an angle of 45°. One can tell this tree from the eastern shagbark by the plates of rough bark on the trunk. They come off in long narrow strips, while the plates on the eastern shagbark are mostly short. The leaves are greener, larger, and more lustrous. The pecan, although of the hickory family, has a smooth bark. Its leaves are narrow, light or yellow-green in summer, turning to a handsome yellow and gold in autumn, and hanging on till late in the fall. The tree is of awing magnitude, often as much as 200 feet in height and 150 feet spread. It has been known to live 1200 years. The hican is much like the pecan in growth, but the foliage is a deep rich green, never turning in the autumn until the heavy frosts cut it down. This characteristic is most desirable in creating a contrast in a border of scarlet and gold colors.

The American walnut leaves are light green, sometimes turning yellow in autumn. Mature trees are wide-spreading stately specimens; they sometimes live 150 years. The English walnut has light green leaves with larger leaflets than the other walnuts. The tree grows large and spreading. It is an excellent and beautiful lawn specimen, with whitish bark on the limbs and rough gray furrowed bark on old trunks. The butternuts have yellow-green foliage. They are hardy, in spreading grandeur in the north, but weaken as they go south. From southern Virginia to Alabama we find them clinging to the ridges, and mostly half-dead from bark blight.

The filberts have simple egg-shaped leaves with fascinating scalloped edges. One outstanding attraction of these bushes is that the male catkins come out in the autumn and stay all winter, reminding you that another spring is coming. Then, in a warm balmy week in early March or

April, the minute reddish female flowers appear; and the catkins swell and ripen, scattering their pollen to the four winds, and then fall off. In spite of the cold you will see, in late spring, little "buds" growing into big "buds"; then suddenly you see that they are little hoods. As these swell and grow, nuts form under the odd and attractive hoods; in the autumn the hoods dry, and out fall gorgeous reddish-brown to brownish-yellow nuts. The only member of the nut group which is outstandingly different in fall foliage is the Chinese chestnut. It has simple leaves, oblong and glossy, which turn brown in autumn and often hang on until December.

Soil Requirements

All nut trees do well on a sweet agricultural soil. English walnuts demand it. In planting them, we apply a bucket of lime on top of the soil, for each tree. Often 50 pounds of lime and 50 pounds of raw bone meal will bring a seemingly sterile old tree into heavy bearing. American walnuts will grow on a soil of 5.5 pH; but a sweeter one is better. The chestnuts lean to acid soil, although we have them growing in fine agricultural soils.

The walnuts and chestnuts are best on well-drained soils. The pecans and hickories are at home on the bottom lands, but will do well wherever humus, food, and moisture are provided. The filberts love moisture; yet we find their cousin, the American hazel, growing all over the mountains of America wherever the axe or plow has not caught up with them. All nut trees love deep soil.

Planting

The filbert and the chestnut can be planted by any expert gardener with success. All the others should be bought from a recognized nut nurseryman who has taken good care of his trees before shipping; and only his instructions should

be followed. I cannot emphasize this too much. You know the old saying: "God protect me from my friends: I can take care of my enemies myself." And friendly advice on planting nut trees surely causes enormous losses. This is because they are taproot trees with few side roots. Success lies in following a few simple instructions that the nut nurseryman has worked out through losses and tears.

Dig a hole so large that you don't crowd the 3- to 4-foot taproot of the hickory or pecan (2 feet on the walnuts). Don't blame the nurseryman for not shipping you a tree with a bush of roots like the beard of a rustic. Don't plant it carelessly because you are sure it won't grow anyway. Remember that these trees are rare because few people know how to plant them. Drop six inches of top soil in the bottom of the hole, tamp well, then slowly fill the hole and tamp well and hard. Tamp the soil up against the taproot. Pull out the few side roots, spreading them as far as possible. DON'T water as you plant "because that's the way you always did with other trees." When you come to the last root you'll be about 2 inches from the top of the soil; here mix in 2 pounds of raw bone, tankage, or dried blood. THEN, after you've made your last tramp around the tree, soak the earth with water. Keep the soil cultivated in a wide circle; water it whenever it's the least bit dry, during the first summer, and even during the second. For BEST results use warm water, but be sure that it's not hotter than your hand can bear.

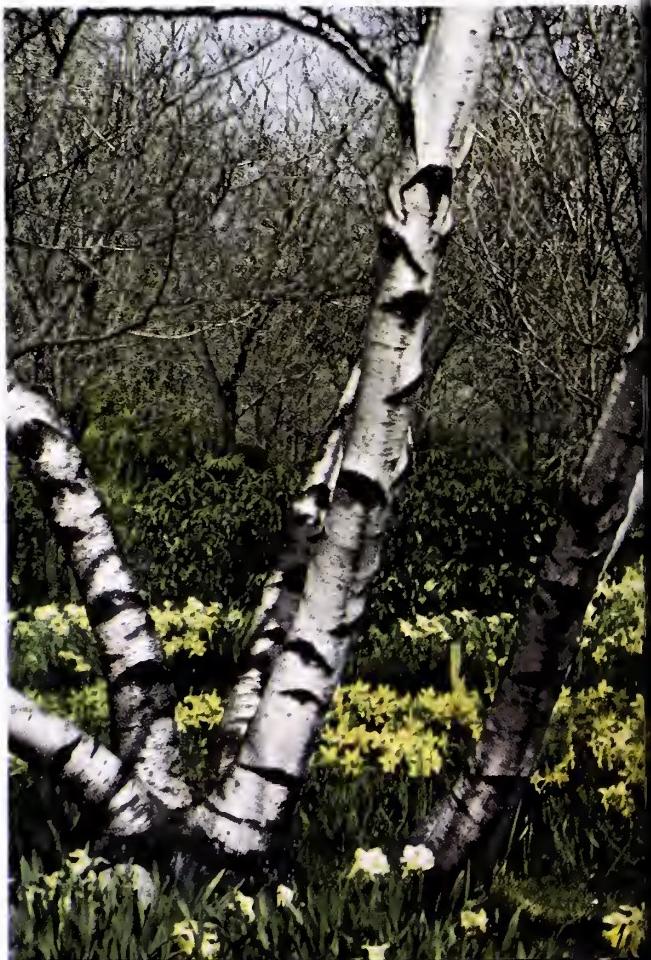
Such a tree will make 2 to 4 inches of growth the first year. Keep up the good work of hoeing and watering; and it may make 6 feet of growth the second season, and keep on going at high speed. Yes, it's a little work and care; but in return you obtain a beautiful lawn tree, and wagonloads of nuts of the highest quality for home use, market, and wildlife.



A branch of Silver Bell (*Halesia carolina*). A small ornamental tree (often bushy) decked with clusters of bell-shaped flowers in early spring.



Hemlock (*Tsuga canadensis*) excels all evergreens where a handsome hedge is desired.



Clustered white-barked trunks of gray Birch combined with its graceful branching habit lend charm to informal plantings.

The long, drooping branches of Weeping Willow beautify even an ordinary stream or pond.



Sweet Bay (*Magnolia virginiana*) is a small, sparse-foliaged tree. Its cup-shaped and fragrant flowers appear in late spring.



Carmine Crabapple (*Malus atrosanguinea*) adds a brilliant pink color mass to the spring landscape.



TREES FOR CITY STREETS

E. A. Piester

A VERITABLE forest; I can scarcely realize that there are thousands of dwellings and people there." Those words were recently spoken by a young Englishman as he looked out over a large portion of our city. I hope those words startle you, kind reader, as they did me, into a new realization that the city trees, in our private lands and in our public streets are a priceless heritage commonly taken for granted. In but few cities is the value of trees on streets and in public parks brought to the attention of school children, and their life-long interest enlisted in maintaining and protecting them. Adults are mostly preoccupied with other matters, and leave it to a restricted municipal department to fight not only the trees' natural enemies, but even the populace, who should be co-operating.

Need of Replanting

A century or two ago the thoughtful New Englanders planted elms or hard maples to shade the streets, roadsides and homes. Many of these trees have endured the climate and the close association with people until this day. But their tide of life is ebbing. The diseases and other vicissitudes of civilization have multiplied, and not only check their vitality, but jeopardize the successful growth of later plantings.

With the advance of the Dutch elm disease in many States, we can no longer plant elms with assurance that they will grow to any size or maturity. If we plant them, we can only hope they may live long enough to justify the effort. Of course it will be hard for most of us to give up the most popular and adaptable of all trees, but it seems to be inevitable.

In many eastern States a blight (*Gnomonia veneta*) is becoming more prevalent and makes us seriously question the desirability of sycamore or plane trees (*Platanus*). The same might also be said of maples. In one short avenue, I have seen eighteen out of twenty-six Norway maples lost in four years due to the incidence of Verticillium wilt.

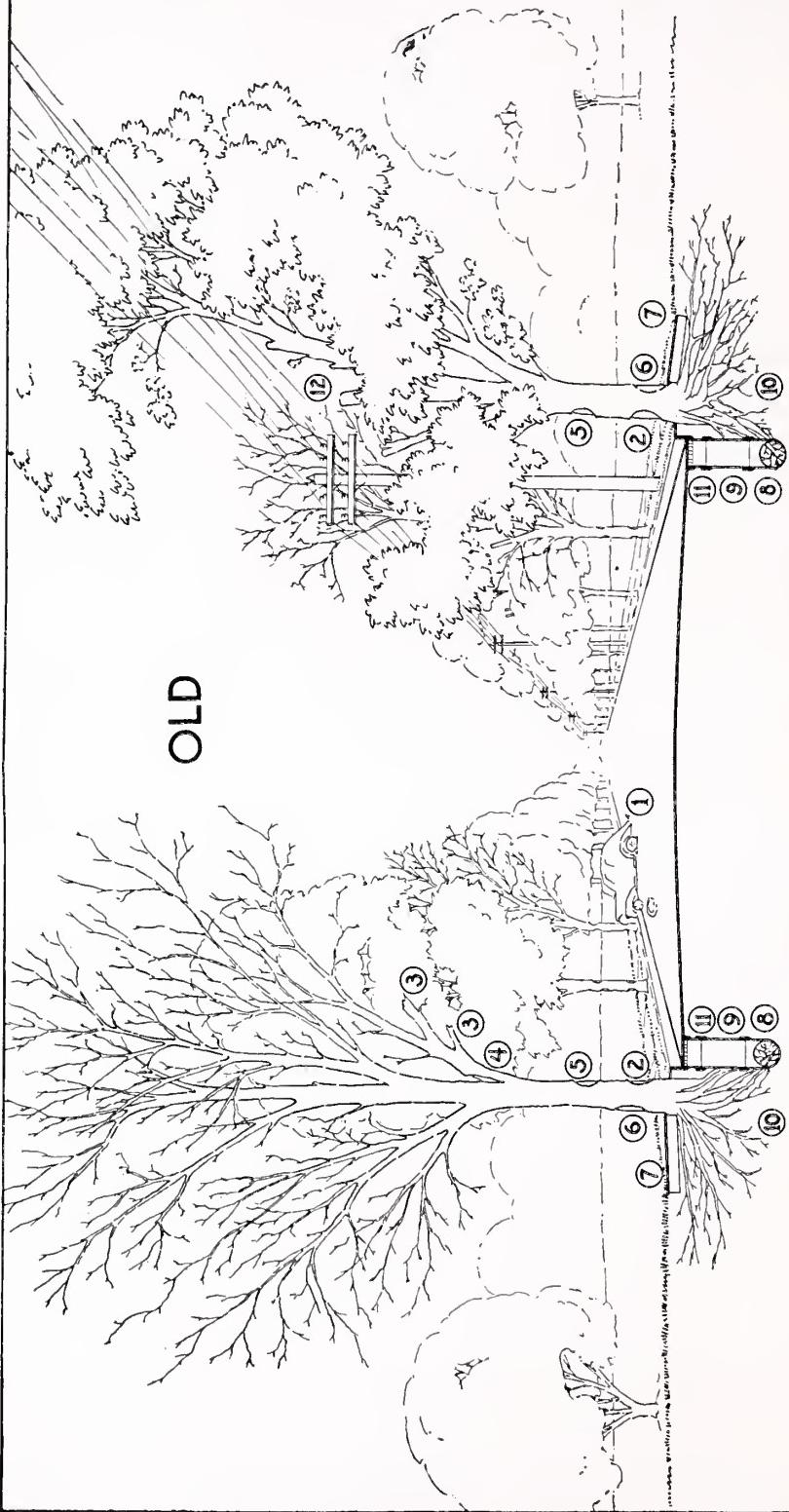
From these three citations, I think it is evident that there is a necessity for increasing the interest of the public in the matter of not only street trees, but domestic tree-planting and maintenance. In particular, everyone must anticipate the early loss of some trees through disease and the obvious necessity of making many replacements. This replanting will, of course, mean a loss of uniformity and symmetry so long considered an essential character of street tree planting.

Within the hour, I have passed through one of our oldest streets and noted how effective it is, even in age. It lacks much



Courtesy Massachusetts Forest and Park Association, and Department of Landscape Architecture, Harvard University.

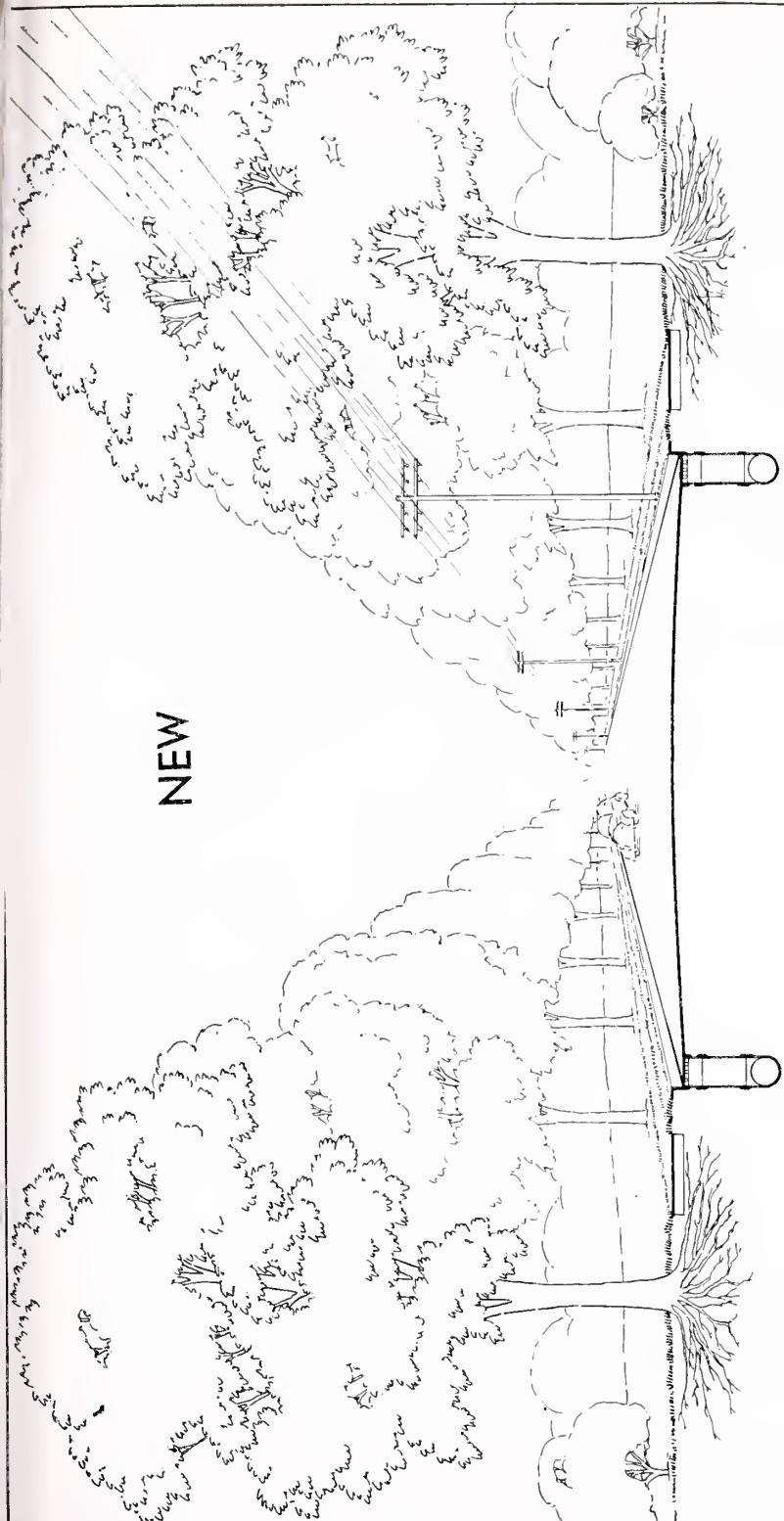
1—Accidents—many deaths. 2—Damage by automobiles. 3—Obstruction to vans and damage to trees. 4—Danger to travel by falling limbs. 5—Trunk damage by horses and trucks. 6—Damage by sidewalk snowplows. 7—Sidewalks lifted by roots. 8—Plugged sewers. 9—Death of trees by utility construction. 10—Lack of water for roots. 11—Tree weakened by cutting of roots. 12—Tree weakened due to overhead wires.



Courtesy Massachusetts Forest and Park Association, and Department of Landscape Architecture, Harvard University.

Greater safety to travel—Cheaper to plant, easier digging, no guards required and fewer replacements—Fewer trees killed by utilities construction—Saving to public utilities with lower rates to public—More available food and water, better root expansion and healthier trees—Freedom from mechanical injuries due to travel—Easier to put wires underground—Becomes part of landscape planting of home grounds with increased real estate values—Street appears wider with more pleasing effect.

NEW



in uniformity, for our ancestors were not obsessed with the idea of regimenting all the trees of the neighborhood. In these few blocks are old trees of various species. Scotch elm, American elm, sugar maple (*Acer saccharum*), sycamore (*Platanus occidentalis*), linden (*Tilia americana*), tulip-tree (*Liriodendron Tulipifera*), horse-chestnut (*Aesculus Hippocastanum*), ash (*Fraxinus americana*), beech (*Fagus grandifolia*), and oak (*Quercus rubra*), and possibly others, make up the array. There have been some replacements. There are some vacant spaces. But there has been no general decimation such as might have occurred if only one species had been planted. Professional city foresters and some of my friends among the landscape architects will chide me for such heresy, but the lesson I seem to read from this page of Nature's open book is "plant more street trees and diversify them, even as trees are diversified in most natural locations."

Good Street Trees

We have certain rather definite ideas about street trees. They should transplant readily, preferably with bare roots rather than with a ball of earth. They should readily adapt themselves to the new location with a minimum of care. They should develop with branches well out of the way of traffic vehicles, without distorting the characteristic appearance or form of the species. They should not have exceptionally large or far-reaching roots that disturb curbs, walks and underground utility lines. They should have a moderate density of foliage sufficient for shade; but should let light enough through, to permit grass and other growth underneath. Those are a few of the specifications; and taken together, they are very difficult to satisfy.

Elms, maples and planes have met those requirements in the North better than most other species. There are no substitutes for them, only alternatives. As a group the oaks are probably the next best. They are not actually so slow-growing as they are commonly considered. They are rugged and adaptable. The greatest difficulty, probably, is in transplanting them successfully with bare roots. Scarlet oak (*Quercus coccinea*) and pin oak (*Q. palustris*) are most common and most adaptable as street trees. The latter is especially adapted to relatively narrow residential streets. Red oak is probably best moved with a ball of earth.

Various lindens (*Tilia*) are common street trees, especially where there are good atmospheric and soil conditions. In areas infested by Japanese beetles they require extra care to preserve a reasonable amount of the foliage. Where soil conditions are reasonably good the sweet gum (*Liquidambar*) can be used effectively, and should be used more extensively, in spite of some extra care needed in planting and the somewhat objectionable hard spiny fruits.

Hackberry (*Celtis*) easily passes for elm and could be used more frequently. Ginkgo or maidenhair-tree is variable in habit and exotic in appearance; but it is adapted to city streets if the individual trees are produced by asexual reproduction from male trees, thus avoiding the foul odor of the fruits produced by female trees.

Various varieties of poplars (*Populus*) are not recommended for general planting because of several faults, including brittle wood, and root systems injurious to utility systems and walks. The same objections apply to the silver or soft maple (*Acer saccharinum*).

TREES TO AVOID ON THE SMALL PLACE

Gertrude M. Smith

TREES exert such an influence on the vegetation that surrounds them that the owner of a small place should use the greatest care in choosing what to plant, and where. When I say small place, I am thinking of the countless lots that average 50 by 150 feet, and of the many only a little larger.

Often suburban lots are fringed by trees of assorted kinds and sizes. In new developments these may be the remnants of field boundaries, or growth that has sprung up in the interval between the abandonment of the land for farming and the building of houses. If the land was wooded, they will be native trees, usually tall and thin from their former forest environment, and now, robbed of many of their former companions, and perhaps damaged by unthinking workmen, rather lonesome-looking.

All these trees should be considered before any new ones are added. You must decide what is needed in the way of trees. The enthusiastic gardener who wants to raise such sun-loving plants as peonies, iris, or roses must be careful indeed. In addition to plenty of sun and air, he must have ground free from hungry tree roots. One tree for shade, probably in front of the house, may well be all he will need. He may be able to use a few small ones for screening and for ornament.

Trees Already on the Place

It is important to find out what kinds of trees the existing ones are, and to visualize their development through the coming years. In the case of forest trees, the advice of a good tree surgeon may be a wise investment. He will be able to tell you what trees can best adapt themselves to the new conditions and grow into good specimens. He can also take care of in-

juries the trees may have received, and give you valuable advice on helping them through the difficult years of readjustment.

Comparatively new growth offers an entirely different problem, especially in sections where European and Asiatic trees have been growing nearby. The species that appear will be those that are most aggressive, which are not at all the same as those most desirable. Often the seedlings are so close together that they are straggly and misshapen. You may decide that the easiest solution is to make a clean sweep, and begin again with nursery-grown stock. But if you want the fun of really getting to know your trees, you will look them over carefully, and see what you can find. There may be small flowering dogwoods, or a few native shrubs worth saving. There may be a good little oak, or a sour gum (*Nyssa sylvatica*) ; or, among exotic trees, one of the lovely lavender-flowered Paulownias. But be firm with yourself. Do not save a tree of the wrong kind for your place.

It is best not to try to move one of these chance seedlings. It is difficult to take one up with a good root system. You will get off with a better start with a properly grown plant from a nursery. On many a suburban place these young trees are not attended to, and then the time comes when the absent-minded owner suddenly realizes that a forest is closing in around him: a forest of poor quality, but expensive to remove.

Undesirable Trees

When you have decided how many trees you need to buy, and the size you want them to attain when they are mature, the next step is to decide on the kind. This is where trouble starts. The ideas of countless homeowners, and of too many nurserymen, on shade trees for the home, are sadly limited. Many a small place is

ruined for grass and for flowers by the shade trees that are planted, and many a house lacks sun and good air circulation because of the same trees.

The Norway maple has been greatly overplanted as a lawn tree. It has become well known because of its widespread use as a street tree; because nurseries have grown it in great quantities; because it is easily transplanted; and because it stands difficult conditions. It seems to be the first, and too often the only tree that people think of buying. But each year that it grows on your lawn, more than the dense round crown will be growing; the roots will be spreading out further, and very efficient roots they are. Any plant that is near them will have to take the leftovers of water and plant food, and there won't be much left over. Even a fairly large tree of a less aggressive species will become misshapen and spoiled by a Norway maple, growing too near it. I emphasize these undesirable traits especially because so many Norway maple seedlings spring up each year and grow undisturbed, doing great damage to other trees, to shrub borders, and to flower beds.

There are several other trees that are not suitable for small places. The fragrant lindens, the horse-chestnuts, and the various beeches, depend on plenty of room to develop their true beauty. Their branches are apt to sweep out and down almost to the ground, and their dense foliage and surface roots prevent the growing of grass under them. The weeping willow is often chosen for the small place, but it is a thirsty tree, and gets too big. Poplars, overplanted for many years, are not so often chosen now, because their faults have become widely known. Their only place is where other trees won't grow. The sycamore, or plane-tree, is another tree generally known

and often planted, which is undesirable for the same reason as the Norway maple, although it isn't quite so bad.

The silver or soft maple, and the red maple are not much better than the Norway, because of their surface roots. Furthermore, they are very brittle and easily damaged by storms. Sweet gums, lovely though they are, need more room than the very small lot will allow. The white ash is not apt to be planted, but a chance seedling may appear. It is not very attractive as a young tree. The elm has a high crown, which admits sun and air, but its surface roots will create a problem. The greedy mulberry and the prolific ailanthus are apt to appear as seedlings, and should be promptly rooted out. A mulberry, even when quite small creates a small desert around itself.

Of course if a mature specimen of any of these trees is already on the property you have another problem. A fine elm or ash you would surely keep and love. But a mulberry, Norway maple, or poplar might better be taken out, no matter how large and shapely it is, and replaced by a tree that has a less monopolistic tendency. Many people hesitate to destroy the only shade they have, but the longer they wait the more trouble it will be to remove the offender.

The price of an 8- to 10-foot deciduous tree is not great; and a desirable oak can be bought for the same price as a maple, or only a dollar or two more. Most of the flowering trees are quite inexpensive in small sizes. Yet you may spend many dollars in dribs and drabs trying to grow grass where it won't grow, or patching up the broken top of your silver maple or boxelder, or buying roses that lead a dreary existence with surface-rooting trees too near them. Choose carefully, think ahead, imagine your tree in 10, 20, and 30 years.



UNUSUAL TREES

Laura L. Barnes

THE tendency in recent years has been for gardeners to plant trees or shrubs that are easiest to propagate—therefore cheapest in price—and entirely neglect some of the so-called “unusual” trees. These trees are not to be classed as rare; for in looking over the catalogues of some of the nurseries of the early eighteenth century, or the lists of trees growing in John Bartram's garden, as well as in other gardens of that period, one finds names of trees almost unknown to many of the present-day gardeners.

At the Arboretum of the Barnes Foundation, Merion, Pennsylvania, we are endeavoring to demonstrate the wealth of material available to garden needs, and the uses to which it may be applied. So, from our collection of about 1700 species and varieties of woody plants, I have selected a few that can be used to good advantage.

Hovenia, belonging to the buckthorn family, named after David ten Hoven, a senator of Amsterdam (1724-1787), has only one species, *H. dulcis*. Although a native of China, it is called the Japanese raisin-tree. It has been in cultivation since 1820. The greenish flowers are almost concealed by the alternate, bright green, long-petioled leaves, and the fruit somewhat resembles a bunch of dried raisins. The bark is rather shaggy, reminding one of *Carya ovata*, the shagbark hickory. The tree is perfectly hardy; ours was planted in 1888. It seems not particular as to soil, but prefers an open, sunny situation. It grows 30 to 50 feet tall.

Koelreuteria, a member of the soapberry family, is named after Joseph G. Koelreuter, professor of natural history at Karlsruhe (1783-1806); it has 4 species in China, only one of which,

Koelreuteria paniculata, is cultivated in this country. It is known as the Chinatree, goldenrain-tree, varnish-tree, etc., and is valued for its conspicuous panicles of yellow flowers appearing in mid-summer. This tree is a native of China, and was introduced in 1763. Koelreuteria lends itself to specimen planting not only because the flowers are attractive, but because the large compound leaves are ornamental; they are green until fall, then turn a bright yellow, and with the bladder-like brown fruit make an interesting picture. It grows to 30 or 40 feet, withstands drought and hot winds, and prefers a sunny location. There are 2 varietal forms, *K. paniculata fastigiata*, which is upright in habit, and *K. paniculata apiculata*, with bipinnate leaves.

Davidia, belonging to the tupelo family, is named after Armand David, a French missionary in China, who in 1869 was the first to discover this tree. It became lost to cultivation until in 1888 Dr. A. Henry found a specimen in Yunnan;

Dove tree, an uncommon and interesting tree with good foliage and odd white flowers



but again it disappeared until finally, after a long hazardous journey, Ernest H. Wilson in 1900 succeeded in locating a grove of these trees in a small hamlet in Northern China. He called it "the most interesting and most beautiful of all the trees which grow in the north temperate region." There is only one species, *Davida involucrata*; it is called the dove-tree because the two white pendulous bracts, which subtend the flower proper, when stirred by the slightest breeze, resemble huge butterflies or small doves hovering amongst the branches. The bracts are unequal in size, the larger usually 6 inches long by 3 inches wide, and the smaller, 3 inches long by 2 inches wide. At first they are greenish, then they become white, finally changing to brown before they fall. The fruit is pear-shaped, green with a purplish bloom. The tree is tender only when young, and grows to a height of 50 feet, having rather ascending branches.

Evodia, a member of the rue family, and *Phellodendron*, another member of this same family, are both opposite-, pinnate-leaved, and form tall graceful trees with foliage turning yellow in the fall. *Evodia Daniellii* and *E. hupehensis* are natives of China and are equally desir-

able; they were introduced to cultivation in 1905. *Phellodendron amurense*, the Amur cork-tree, is a little less hardy than *P. sachalinense*, but is conspicuous in winter with its thick corky bark. These are dioecious and so, in order to have the enjoyment of the black glossy fruit, which remains on the tree after the leaves have fallen, it is necessary to have both the pistillate and the staminate forms.

Among our gray-or silvery-leaved trees particularly effective if planted with an evergreen background, is *Elaeagnus angustifolia* (oleaster family), which, unlike the other members of its genus, attains tree-size; it is known as oleaster or Russian olive. The leaves are silvery as are also the young branches; and in spring, when it is covered with its yellow flowers, whose fragrance perfumes the air, it is a specimen worthy to be in any garden. John Bartram had it in his garden, and it has long been cultivated in Europe.

Idesia, belonging to the flacourtie family, named after Eberhard Y. Ides, Dutch traveler in China (1691), has one species native to East Asia, *Idesia polycarpa*. It is a tree growing to 40 feet, with grayish-white bark, and greenish-yellow fragrant flowers in panicles, followed by dull

A branch of oriental (Kousa) flowering dogwood





Famous weeping beech of Flushing, N. Y.

orange-red fruit. This tree was introduced in 1864, but is seldom seen in gardens, although the fruit is most attractive, and the tree is perfectly hardy. It is sometimes dioecious.

Cornus Kousa (dogwood family) prolongs the flowering season of *Cornus* (the dogwoods), and so it is a tree worth having. It flowers in mid-June or later; and its upright heads on slender stalks above the rich green of the leaves give the impression of snow on the branches, particularly if it is planted on a slope, where one can look down upon it. The white bracts last more than a month, and finally become pink before they fall. This species is a native of Japan and Korea, and has been sparingly in cultivation since about 1860. The central China type, *C. Kousa* var. *chinensis*, was introduced by Ernest H. Wilson, and has larger and broader bracts.

All gardeners are familiar with *Fagus*, the beech, in its several species; but perhaps a varietal form of *Fagus sylvatica*, the European beech, *F. sylvatica laciniata*, is not so well known. This form is called

the fernleaf beech; it is well named as its leaves are incisely serrate, giving the tree a dainty feathery appearance. Nothing could be handsomer, at all seasons, than a mature tree with its beautiful foliage in summer, its gray bark, and its twiggy branches giving it in winter a symmetrical compact outline.

Abies Veitchii, Veitch's fir; *A. homolepis*, Nikko fir; *A. Nordmanniana*, Nordman's fir; *Pseudolarix amabilis*, golden-larch; *Cedrus libani*, cedar of Lebanon; *C. atlantica*, Atlas cedar, and its variety *glauca*; *Sciadopitys verticillata*, umbrella-pine; *Cunninghamia lanceolata*, China-fir; *Libocedrus deodara*, incense-cedar, are among the gymnosperms which we have growing here and have found hardy. All lend themselves to beautifying the grounds, and are different from most of the evergreens used in planting.

This is a very incomplete list of "unusual" trees; it could be extended almost indefinitely; but I offer these suggestions, hoping that they may be of service, because in gardens there is and always will be a place for the best.

ORNAMENTAL CRAB APPLES FOR FLOWER AND FRUIT

Donald Wyman

THE Oriental flowering crab apples are an ornamental group of small trees that should be given primary consideration whenever extensive planting is to be done. Some of our trees are stately shade trees, having green foliage and interesting autumn color; such are the oaks, a truly splendid group. Others, like the cherries, are valued for beautiful spring flowers; but the remainder of the year their ornamental characteristics are mediocre. We must use such trees; there is a place for them in most planting plans; but consider, if you will, the merits of the flowering crab apples; and see if they should not have consideration at least, every time a planting plan is drawn.

They have beautiful spring flowers, appearing in mid-spring just before the lilacs. There are many from which to choose for this purpose: the Arnold crab apple with large pink and white flowers, the carmine crab apple with carmine flowers, the Parkman crab apple with pink semi-double flowers, and the Aldenham crab apple with semi-double reddish flowers. The Mandshurian crab apple has pure white flowers, as do many others. In fact, these few represent a very large list, some with single flowers, some with double.

The habits of these beautiful trees also show a wide range, from the comparatively low (6 to 8 feet) Sargent crab apple to the Siberian crab apple, which is a standard tree well over 50 feet in height. Most of the Oriental crab apples are mound-like in habit and under 25 feet tall; for this reason they are well adapted to planting on the small property.

The feature which makes them far su-

perior to the cherries and many of the other flowering trees is their ornamental fruits, ranging from crab apples the size of a pea, to those nearly 2 inches in diameter. The color, shape, and length of effectiveness of these vary considerably. For instance, the fruits of the Arnold crab apple are pure yellow; those of the Aldenham crab apple are a purplish red; those of many so-called cherry crab apples (actually a hybrid, *Malus robusta*) are usually a brilliant red. Some species and varieties have fruits starting to show color the second week in August, while the fruits of others remain colorfully effective on the trees throughout September and October. A few ("Bob White" crab apple and *M. Zumi calocarpa*) have fruits that remain on the tree the greater part of the winter, affording a splendid food reserve for many birds during a period when most of their food is covered with snow.

The crab apples are among the hardiest of plants, growing wherever apples will; and a few, like the Siberian crab apple, are much more hardy than the common apple. Because of its hardiness, this particular species has been used a great deal in hybridizing work, in an effort to find an apple hardy in the coldest parts of the United States. As a group, the crab apples are vigorous and easily grown, and take comparatively little care. It is unnecessary to spray more than once every year or so. A dormant oil spray is used for scale, which in many parts of the country is not prevalent. Some pruning or thinning should be practiced, and borers should be cut out occasionally; but all in all, the care necessary for the good growth of these trees is small enough when one considers the long period of time during the year when they are ornamenteally effective.

There are nearly 150 varieties offered in the nurseries of this country. They prove a potential gold mine for specimens on large or small properties, for massing, for aids in wild life conservation over a very long period, and for yielding beauty during several seasons of each year. They are an excellent group, well worth consideration at all times when plantings are contemplated.

Some of the best varieties are:

For Flower

Malus:

- Arnoldiana*
- atrosanguinea*
- coronaria*
- coronaria Charlottae*
- coronaria Nicewandiana*
- "Flame"
- floribunda*
- Halliana*
- "Hopa"
- hupehensis*
- ioensis plena*

- "Montreal Beauty"
- purpurea*
- purpurea aldenhamensis*
- purpurea Lemoinei*
- "Red Silver"
- "Red Tip"
- Sieboldii*
- Zumi* var. *calocarpa*

For Fruit

Malus:

- Arnoldiana*
- atrosanguinea*
- baccata*
- "Beauty"
- "Bob White"
- "Dolgo"
- "Flame"
- floribunda*
- "Hopa"
- "Montreal Beauty"
- purpurea aldenhamensis*
- purpurea Lemoinei*
- toringoides*
- Zumi* var. *calocarpa*

Foliage and Fruit of Arnold crab apple

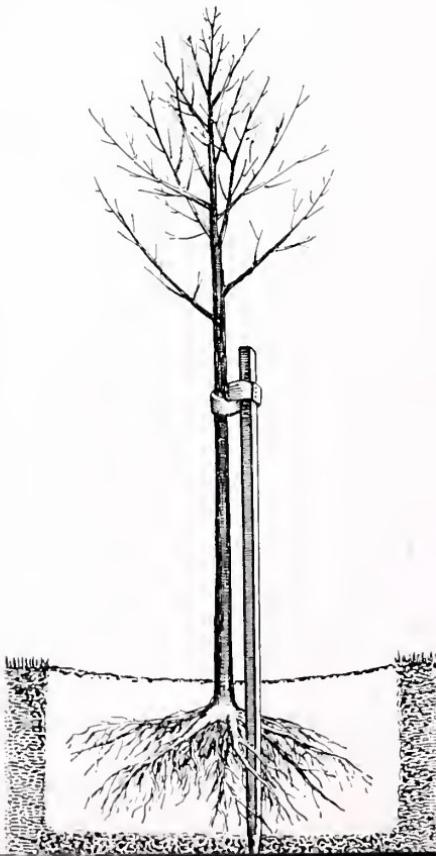


HOW TO TRANSPLANT TREES

Arthur F. Paul

WHEN one transplants a tree, one expects it to keep on living and growing in its new location. The realization of this expectation, however, depends largely on the things we do to the tree when we transplant it. The procedures employed in successful transplanting are based on a knowledge of the life processes of trees—the relations of roots and soil, stems and leaves, moisture and light. The study of these relationships,

Proper method of planting a young tree: A hole large enough for the natural spread of the roots; top soil worked in around the roots, leaving a saucer-shaped depression at the surface to facilitate watering; stake put in place at the time of planting and fastened to prevent injury



of these life processes, is the province of the botanist and the chemist. The transplanter of trees accepts their findings and translates them into practical methods and simple practices which can be easily followed by the least scientific spade-wielder.

The practical transplanter knows that he must keep several general principles in mind. The chief of these are:

(1) As many as possible of the feeding roots (the fine fibrous ones) must be saved.

(2) These roots must be prevented from losing their moisture.

(3) Since many of these roots must be severed and lost in the digging up, a compensating loss of leaf surface must be provided, by pruning the branches or twigs, to lessen the drain on the roots that remain.

(4) Conditions must be provided in the replanting to make it as easy as possible for the roots to resume their natural functions, and to supply the kind of soil and amount of moisture they require for these functions.

In applying these principles in the practice of transplanting, two methods are commonly employed: (a) digging the tree and removing the soil from the roots—the “bare-root” method; and (b) lifting the tree with a ball of soil about the roots undisturbed, and securely held in place with strong, light material like burlap—the “ball-and-burlap” method (B&B).

In the following discussion, it is assumed that we are talking about trees of moderate size, that is, trees up to about 4 to 5 inches in diameter, or shrubs up to about 4 or 5 feet high, which can be handled by ordinary labor processes. The transplanting of larger specimens requires special skill and equipment, and should be undertaken only by experts who understand the use of such equipment and possess the necessary skill.

Bare-root Method

The bare-root method is very much less expensive than the other, since less labor is involved. It is applied chiefly to the smaller sizes of trees and shrubs where they can be replanted immediately and do not have to be subjected to the vicissitudes of long travel.

The tree is dug in such a way as to preserve the maximum number of fibers. A sharp spade is used in this work so that necessary root cutting is done cleanly. Care is exercised in removing the soil from the network of roots so that the fibers are not torn away in the process; forks and sticks are used for this, never shovels or spades. The roots of the trees thus dug are then covered with moist burlap or heeled in in loose soil until replanted.

The replanting should be painstakingly done. The new hole, a foot wider than the spread of the roots, should be dug to a depth which will allow the tree, placed in the center of the hole, to stand at the same level at which it originally grew. Much failure in transplanting is due to

too deep replanting. Before the tree is set, all bruised and broken roots should be pruned off cleanly.

The next step is one of vital importance: the firming of the soil about the roots. It is understood, of course, that only good top-soil should be used for this. This firming is done either by a gentle stream of water from an unnozzled hose, or by ramming with a wooden rammer. All crevices must be filled. Poking these full of soil requires patience and care lest roots be injured; it must be done with a small round stick not more than 3 inches in diameter. A stream of water does the poking for us more efficiently and gently than the stick. When the ramming method is used, the hole should be thoroughly soaked with water when it is about three-quarters filled with soil. To transplant a tree by *any* method without a liberal use of water is to court failure.

The tree now stands at the proper level, with good soil in firm contact with the roots, and properly supplied with moisture. There remain, for success insurance, three more operations: the pruning

Digging and burlapping a tree for transplanting



of the top (say three quarters of the past year's growth); the mulching of the ground around the tree with loose material like strawy manure or salt hay; and the bracing of the tree against wind pressure to keep it steady. Bracing is usually done with wires fastened to stakes driven deep into the ground, at least 3 to a tree; where the wires would be in contact with the trunk, and thus cut or injure the

bark, they are run through loops of rubber hose.

The bare-root method is applied on to deciduous trees and shrubs. Even among these deciduous trees, there are many species which, experience has shown, can not be moved by this method with assurance of success after they have attained a height of 2 or 3 feet. Here is a list of the most common of them.

Trees

Bald cypress	<i>Taxodium distichum</i>
Beech	<i>Fagus</i> spp.
Cork-tree	<i>Phellodendron</i> spp.
Dogwoods	<i>Cornus florida</i> and <i>C. Kousa</i>
Flowering crab	<i>Malus</i> spp.
Fringe-tree	<i>Chionanthus virginica</i>
Gordonia	<i>Gordonia alatamaha</i>
Hawthorn	<i>Crataegus</i> spp.
Horse-chestnut	<i>Aesculus Hippocastanum</i>
Japanese maple	<i>Acer palmatum</i>
Katsura-tree	<i>Cercidiphyllum japonicum</i>
Larch	<i>Larix</i> spp.
Magnolia	<i>Magnolia</i> spp.
Mountain-ash	<i>Sorbus</i> spp. over 6 to 7 feet
Oak	<i>Quercus</i> spp. over 1½ inches in diameter
Pagoda-tree	<i>Sophora japonica</i>
Persimmon	<i>Diospyros virginiana</i>
Redbud	<i>Cercis canadensis</i>
Shadblow	<i>Amelanchier laevis</i>
Smoke-tree	<i>Rhus Cotinus</i>
Snowbell	<i>Styrax japonica</i>
Sorrel-tree	<i>Oxydendrum arboreum</i>
Sour gum	<i>Nyssa sylvatica</i>
Stewartia	<i>Stewartia</i> spp.
Tulip-tree	<i>Liriodendron Tulipifera</i>

Shrubs

Abelia	<i>Abelia grandiflora</i>
Azalea	<i>Rhododendron</i> spp.
Bayberry	<i>Myrica</i> spp.
Blueberry	<i>Vaccinium</i> spp.
Bottlebrush buckeye	<i>Aesculus parviflora</i>
Enkianthus	<i>Enkianthus campanulatus</i>
Fragrant viburnum	<i>Viburnum Carlesii</i>
Rose daphne	<i>Daphne Cneorum</i>
Turquoise berry	<i>Symplocos paniculata</i>
Winterberry	<i>Ilex serrata</i> and <i>I. verticillata</i>
Winter hazel	<i>Corylopsis spicata</i>

Ball-and-burlap Method

The ball-and-burlap method, while involving more labor and expense, is by far the safer and surer way. The purpose of this method is to move the tree with little or no disturbance of the roots. A trench is dug around the perimeter of the ball of earth which is to go with the tree, wide enough to allow the diggers to bind the ball with burlap and lift the tree from the hole easily, and deep enough to include the main mass of root fibers. For trees of the size we are talking about, this depth will usually be not more than 18 to 24 inches for most of the species. Any excess of soil, in either the depth or the width of the ball, not needed to protect the roots and hold them firm, adds to the weight and makes handling more difficult and expensive. It should be borne in mind that, if the weight of a balled tree is beyond the capacity of the number of men employed in the operation to lift and handle easily, much harm may be done to the ball by rolling it over the ground or dropping it with a thud; and if the ball is thus broken or softened, the objective of the whole operation is missed.

This method is used for the moving of all evergreens, coniferous and broad-leaved; for the deciduous species named above; and for any other deciduous trees or shrubs when special precautions are desirable. If trees are to be moved late in the spring after the dormant stage has

passed and growth has started, then it is the only safe way. The trees transplanted by this method should have the same care during and after planting as outlined above for a bare-root job.

To serve as a very general guide for the size of ball for a specific size of tree or shrub, the following schedule is appended. It is hoped that it will not only be a guide to ball size, but also serve as a basis for calculating the number of men necessary to do a specific job easily and successfully. Let me emphasize again that this is only a very general guide. Experience teaches us how circumstances and conditions determine action. A nursery-grown tree, for example, which has been often transplanted, requires a much smaller ball than one dug from its natural habitat, because the feeding roots are closer to the crown.

Size of Tree and Diameter of Ball

<i>Tree</i>	<i>Diameter of ball</i>
1 inch thick	16 inches
1½ " "	17 "
1½ " "	18 "
1¾ " "	21 "
2 " "	24 "
2½ " "	28 "
2¾ " "	30 "
3 " "	32 "
3½ " "	36 "
4 " "	40 "
5 " "	48 "

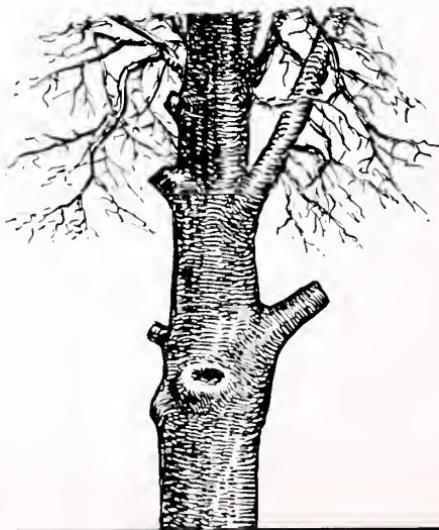


HOW TO PRUNE TREES

Stanley W. Bromley

AMONG the casualties of World War II may be counted many of our shade and ornamental trees, indirect casualties to be sure, but none the less definite in the final effect. Expert care of our trees lapsed in many localities during the war years, because of a variety of causes which would be too numerous to evaluate or even list here. Even Nature seemed to turn against our trees in the past few years. Extensive tree damage resulted from such natural catastrophes as the hurricane of September 14, 1944; the great drought of the summer of that same year; the devastating outbreak of the elm leaf beetle in 1945; and the late spring frosts of unusual severity in the same year, that of April 23rd being the most widespread and the most destructive, coming as it did after an unusually hot March. Such factors have resulted in much dead wood, making pruning a no. 1 must, if normal health of our shade trees is to be maintained. It is vital that proper pruning be done. There is pruning and "pruning." Untold damage has been done in the past by improper pruning. The

Improper pruning with stubs remaining and wound cavity developing at the center



tree butchery of the old days should definitely relegated to the past.

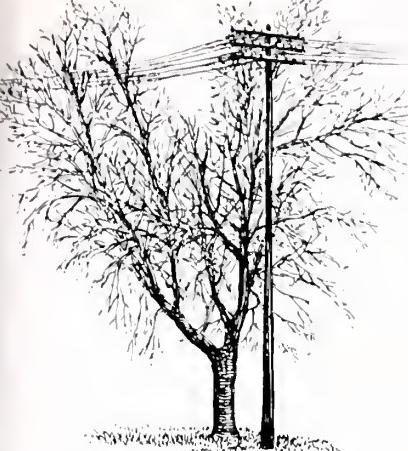
What are the principles of proper pruning? Of primary consideration is the removal of broken or undesirable branches in such a way as to promote healing. Pruning is as much a building for the future as it is a removal of the parts injured in the past. Inasmuch as smooth cuts are essential to proper healing, pruning should be done with this principle in mind. Cuts should be made flush to the trunk or branch; it should be remembered that a dead stub furnishes a pathway for fungi causing heart-rot, and that a small wound heals more quickly than a large one. After the cut is made, the next important consideration is the protection of the wound with a suitable wound dressing.

One of the less publicized functions of pruning is thinning the canopy of a large tree by branch spacing to reduce wind resistance, so that such a tree may better withstand storms and gales. In all cases pruning should be so done that in the removal of unsightly stubs, dead wood, and diseased or insect-infested branches, the symmetry of the tree is preserved. The proof of good pruning is the absence of conspicuous evidence of the pruning work.

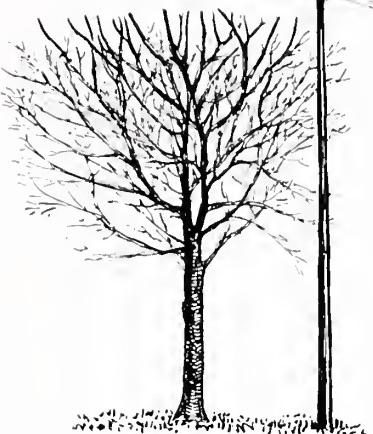
Proper cutting and proper protection of the cuts are important in shade tree care; but these are not the whole story by any means. We should make every effort to conserve and preserve the trees we have left, particularly the older trees. Old trees are irreplaceable. When a 150-

Proper method of pruning large branches
Left—A partial cut on the lower side. Center—Cut on the upper side to remove the branch. Right—Final cut at A so as to leave no stub





Proper pruning to permit wires to pass through the tree without spoiling its beauty



Improper pruning to permit wires to pass over; tree "dehorned" and beauty destroyed

or 200-year-old tree dies of whatever cause—and that includes neglect—it takes at least that period of time for a comparable tree to be produced on the same spot. There is no such thing as mass production of century-old trees. Good shade trees

are the result of good care over a long period of time. The noble trees that still exist as living testimonials of the foresight of previous generations are among our priceless heritages, and as such are certainly worth saving.

Proof of good pruning is the absence of conspicuous evidence thereof

Author photo



HOW TO HAVE HEALTHY TREES

H. Gleason Mattoon

Danger in Using Poisons

FOR protecting trees and other plant life from insects and diseases, we have come to rely so largely on poisons that we are coating the foliage of this country with millions of pounds of poisonous material annually. No accurate record of the amount used upon trees alone is available, but it is estimated that 80,000,000 pounds of arsenate of lead are sprayed and dusted into the atmosphere each year. Calcium arsenate, no less toxic to man and animals, is used to the extent of 70,000,000 pounds. In other words, in an attempt to reduce the ravages of insects, more than a pound of arsenical material is put on foliage annually for each man, woman, and child in the country.

In addition, we are using hundreds of tons of Bordeaux mixture, sulphur, nicotine, pyrethrum, and rotenone. The total bill for insecticides and fungicides runs between \$50,000,000 and \$70,000,000 annually, with many times that amount spent in applying the material. And now we have another and subtler poison to toy with. 3,000,000 pounds of DDT are being manufactured monthly, nearly all of which is going into civilian use. So much has been written about the chemical that little need be added. Suffice it to say that too little is known of its residual properties and the ability of plants to absorb it, to recommend it for use on trees or crops. Also, its non-selective quality makes it equally potent against beneficial insects, a situation which may seriously upset horticultural programs.

The belief that poison is the panacea for plants should be discouraged. The accumulation of arsenic, copper, and other toxic chemicals in the soil may retard the action of enzymes necessary for

normal plant growth. Moreover, reliance on frequent spraying of trees with poisons, "in case some pest appears", is a wasteful and lazy habit which should be condemned by every lover of Nature.

Tree owners are divided into two camps: those who spray every fortnight to keep ahead of the bugs, and those who do nothing but let Nature take her course. The reasoning of the second group is a faulty as that of the first. We do not let Nature take her course. We have brought into this country many insects and diseases that were never intended to be here. A list of the 50 most noxious enemies of trees in the United States would probably include 40 that were immigrant from the Orient or Europe.

Biological Control of Pests

In the next few years the number of seriously injurious exotic pests may increase alarmingly. The souvenirs, baggage, and clothing of returning members of the armed services are all potential carriers of insects and fungi, which may decimate one or more species of tree in this country, just as *Endothia canker* from Asia has all but destroyed the American chestnut. Some entomologists and pathologists anticipate new trouble which will make great headway before control measures are discovered. Little can be done now about the possibility of such attacks; but it would seem, with the ease of travel between continents, that we should have been foresighted enough to have entomologists studying the biological control of insects in their native habitat in anticipation of their appearance here. The cost would have been infinitesimal compared with the destruction caused by the Japanese beetle, the elm leaf beetle, or the gypsy moth.

Biological control should be a principal goal in research. While Nature is never in a state of balance, still without the

terference of man, with his poisons and insect introductions, the pendulum would swing only slightly one way and then another. Every tree owner can do his part a biological control. He should learn to recognize beneficial insects. He should distinguish between an ichneumon fly and wasp; it would be to his advantage in more ways than one. Lady bugs, aphids, mantids, flower flies, *Calosoma* beetles, and chalcids, are among those insects that he should recognize. And of course he should be able to identify and protect insectivorous birds. Such encouragement of beneficial insects and birds will not solve our insect and disease problems, but it will mitigate them.

Transplanting

In addition, we should all give trees intelligent care. A tree is a living thing which must have a continuous supply of moisture and plant nutrients, and congenial surroundings, if it is to thrive. When we transplant trees, we should not be satisfied merely because they live. We should want them to continue to grow normally. If nearly all of the fibrous roots are destroyed either by drying out or by removal, it is obvious that the tree cannot do more than subsist before new fibrous roots are produced. Some of the fine feeding roots are invariably destroyed when a tree is moved. The time between transplanting and the development of a new fibrous root system is the critical period for the tree. Assuming intelligent and careful handling in other respects, if that period can be reduced from months to weeks, the success of the undertaking is assured and the possibility of insect damage is lessened.

The ability of hormones to stimulate quick root development has made it possible to move trees with scarcely any indication that they have been retarded in growth, and with very little injury from insects or diseases. With little diminution in the normal flow of soluble nutrients from the roots to the foliage, the bark does not dry out. It is possible to

tell the points of the compass by examining a poorly planted tree a year after it has been moved. The bark on the southwest side will be found in a dry and cracked condition, usually accompanied by borer damage.

In addition to the joy of having a healthy tree, it costs less to give the little extra time and care necessary for successful transplanting, than to nurse a sickly tree through a year or two of adjustment. Some of the extra care is called for to see that the tree is planted at the proper depth. The fallacy that a tree should be planted deeper than it previously stood has killed countless potential monarchs. Roots must have oxygen. If they are buried deeper than they normally grow they suffer from a deficiency which adds to the difficulty of adjustment. The argument that the roots have to be kept cool is equally erroneous. Many of the roots of most species of trees normally grow only slightly below the surface of the ground. If they are buried too deep they will eventually grow up to the normal level, provided the tree has not died in the meantime. Very probably the piling of soil around the bases of trees and shrubs has contributed to the poor health of many.

General Health of Trees

The soil for healthy tree growth should, of course, contain all of the needed plant food elements. Trees, like man, are less subject to ills if they are robust. There appears to be a definite relationship between insect attack and plant nutrient deficiency. Many wood-boring insects cannot survive in a healthy tree, yet they hasten the death of one that is sick. Moreover it has been noted that some fungi attack weak trees more often than those making normal growth. And so it would seem logical that time and effort devoted to giving trees the plant food elements and water they need might be of greater benefit to them than frequent spraying.

Intelligent Spraying

A balanced diet, ample moisture, and congenial surroundings do not constitute a panacea for trees, but if those needs are supplied trees will require only occasional help from the spray gun. Though we give our trees the best of care, and cater to bird life and parasitic and predacious insects, there will be seasons when certain injurious insects will appear in sufficient numbers to damage trees. If it is necessary to spray, it is equally necessary to know what is to be controlled and when this can be done most effectively. For instance, the bagworm, which hatches in the middle Atlantic States between June 1 and 15, can be killed easily in early June by using 2 pounds of arsenate of lead in 100 gallons of water; whereas if the spray is delayed

until August 15 (when the bags are noticeable) double that strength gives only fair control. Of course, it would be better to pick off the bagworms and put them in a container covered with wire mesh to permit the escape of any parasites that may be infesting them. When there appears no choice but to spray, the new organic insecticides and fungicides should be used. Generally they are less damaging to foliage than the arsenicals and copper sulphate, and are preferable to other ways besides.

If trees have *ample* plant food and moisture, and the tree owner knows what insects and diseases might attack the species he has and when to expect such pests, not only is the protection of trees simplified, but it becomes a fascinating game. It is the battle of intelligence against prolificacy.



THE TOWN FOREST

Harris A. Reynolds

A BEAUTIFUL public forest on the outskirts is a fine introduction to any town. It is to the town as a whole what ornamental planting is to the home grounds—an exponent of the character of the people who dwell there. The development of the community forest, or town forest as it is called in New England, is the most efficient utilization of forest land yet devised. While all forests produce wood, conserve water, and provide homes for wild life and opportunities for recreation, the town forest gives the highest return in these benefits.

The town forest idea originated in Europe, where the scarcity of fuel forced the inhabitants to give thought to the growing of more wood. It was thus born of necessity rather than foresight. Al-

though some of those forests have records running back centuries, they are still being enlarged where opportunity permits. It is not unusual for small towns to pay all of the expenses of local government out of the net profits from their forest. These community-owned forests are found all over Europe, and constitute from 1 per cent to 50 per cent of all the forest lands in the various countries. Although we can not hope, for generations, to reach the state of perfection that obtain in the communal forests of Europe, yet as the needs for wood become more urgent and the demands for local recreation facilities increase, there is little doubt that the town forest here will eventually be as popular as our National and State forests are today.

The modern town forest movement was initiated in this country in 1913, when



Town forest of the future

after a study of the communal forests in Europe, the Massachusetts Forest and Park Association persuaded the city of Fitchburg to establish a forest for the purpose of growing timber. Although many cities and towns already owned forests for water protection and other purposes, Fitchburg claims the distinction of creating the first town forest for timber production in this country under a State law designed for that purpose. The Association has conducted a continuous educational campaign for town forests since that time, with the result that Massachusetts now has 127 town forests averaging about 300 acres in area, on which more than 8,000,000 trees have been planted.

Timber and Water

In a community forest the town grows its own timber, fence posts and fuel wood, which if bought from outside sources would be a substantial item in the annual budget. Its surplus forest products bring high prices because most of them can be delivered by a short haul from the stump to the ultimate consumer. Transportation is one of the largest items in the cost of all forest products. The town forest is often located on the watershed from which the town draws its water supply, and it not only conserves the water but protects its purity; it would be difficult indeed to place a money value on that function of the forest. In

such cases, however, the area can not be used intensively for recreation; but most of the other uses of the forest, such as timber production and the protection of wild life, can be conducted to better advantage on watershed forests, because they are given more careful supervision than other forests of the region.

Apart from the benefits that a town receives from a well managed town forest there is a patriotic motive back of this movement. During the war wood was the most critical of the war materials. This shortage was particularly severe in the eastern States where there are millions of acres of idle, burned-over and clear-cut forest lands. As a matter of national defense these lands should be set to work growing saw logs. In peace-time this region east of the Mississippi River imports about 75 per cent of its wood needs, and pays the people of other regions to harvest, manufacture and transport those products. A large part of this lumber could be grown on these idle acres with our own men. Here is where the town forest fits into the picture. If all our cities and towns containing idle forest land were to develop this under forest management plans, our forest conservation problem would be practically solved.

Wild Life

With millions of our citizens going into the forests each year in quest of game, the time has come when safety zones must be established, where wild birds and animals may rear their young unmolested, if this popular sport is to survive. It has been proved that relatively small areas set aside as wild life refuges have been effective in increasing the game supply in the surrounding country; the town forest is an ideal area for such a sanctuary. In Europe, when the game population becomes too large for the available food in the town forest, a substantial revenue is obtained from the sale of special hunting licenses; when the sur-

plus is taken, the area again becomes a refuge. A game refuge within easy reach of a town not only insures better hunting in the neighborhood, but it gives the young people an opportunity to see and an incentive to learn about birds and animals in the wild. This is a value that can not be readily translated into dollars and cents.

Recreation

Except for the forests located on water-sheds, the most important use of the town forest is for recreation. It is really a self-supporting wild park which brings back to the average town a touch of pioneer life. It provides for all the citizens, especially the children, an opportunity to satisfy that call of the wild inherent in most normal human beings. Each year in normal times visitors to our National and State forests and parks numbering millions, try to get back to nature by hunting, fishing, camping, canoeing, hiking and other forms of recreation. But it requires considerable means to go to those distant points, and the children of lower wage earners are denied that privilege. It is a fact that a large percentage of our population spends the greater part of its childhood and youth in canyons of brick, wood and stone, with the dangerous, dirty and monotonous street as its chief playground. Through charity some of this group may spend a few days at a summer camp. With the town forest within an easy walk or a single bus fare, many of its advantages are available to all the people the year round. It is an ideal area for open-air operations of youth organizations such as the Boy Scouts. Aside from the benefits to the physical health of the community from the use of such forests, the building of character is a natural sequence of learning to cope with the forces of nature. Here is a possible antidote for juvenile delinquency that may be worth more to the community than the total cost of establishing the town forest.

Education

The above prime functions of the town forest by no means exhaust the benefits to be obtained from it. It is an admirable adjunct to the schools as an outdoor laboratory for the study of plants and animals. Many towns are now acquiring school forests, where classes in biology and nature study are held, and where all the children learn the value of conservation by actually planting trees and doing other forestry operations. In periods of depression the unemployed are given useful work in the development of the town forest, and they are able to live at home. During the big depression of

the past decade thousands of men were given work in the town forests of Massachusetts. Many an unattractive area near residential districts can be converted into a beauty spot in a few years and at small expense by the planting of forest trees. Such work is a good beginning for a town forest. Real estate in the immediate vicinity of such a forest is enhanced in value, and thus the town gets an indirect return on its investment in the town forest.

All things considered, there are few investments that a town can make that will pay better dividends than the town forest.



A HEMLOCK ARBORETUM

Charles F. Jenkins

HAVING been reasonably successful in forming a one-genus arboretum, I am passing the idea along to other horticultural amateurs. As a boy I lived in a home with a hemlock hedge along the village street, and as a young man I planted a windbreak of hemlocks back of a new home in the country. When we established a home on the wooded hills of the Wissahickon Valley, where hemlocks grow naturally, the idea occurred to me: "Why not have a Hemlock Arboretum, bringing together in one place all the known species of *Tsuga* and as many varieties as can be secured?" This was in 1931; working with great enthusiasm I have gathered at "Far Country" some 120 specimens of *Tsuga*, in about 40 varieties, with 9 species represented. Probably in no other one place on the globe can so many varieties be found growing together. The Hemlock Arboretum has now become of sufficient

importance to be invited into membership of the American Association of Botanical Gardens and Arboreta.

In 1932 appeared the first issue of little bulletin telling of the newly established arboretum. It was headed by quotation from Dr. Sargent's "Silva of North America,"—"No other conifer surpasses the hemlocks in grace and beauty." The initial issue also contained a statement which is as true today as it was then: "While I lack the botanical and technical scientific training to get the most out of such a collection, I will be able to afford to students, botanists, horticulturists and nurserymen opportunities for comparative studies. I can determine which varieties are safely adapted to our climate and I may be able to introduce to my friends some new varieties which will give pleasure to them." And the Arboretum has worked out in this way. The "Hemlock Bulletin" has been continued quarterly, and the current January issue is now No. 53. It has brought the Arboretum to the attention of personal friends, some scientists, many nurserymen and horticulturists, a few botanists, and members of garden clubs and nature study organizations.

More than half the specimens now growing in the Arboretum have been gift from nurserymen and collectors who have found some unusual variation among their seedlings or in nursery rows. The early foundation stock was largely imported from England, Germany and Japan. Both in England and in Germany appreciation of our variants was much greater than in this country. Take the variety *Tsuga canadensis* var. *Fremdii*, for instance. This variation originated in Rye, N. Y. The original tree was sent to England and later to Holland. From it 10,000 propagations were made by the Dutch nurserymen. A number of English nurs-

Carolina hemlock, *Tsuga Caroliniana*

Gustave Liebscher photo



eries specialized in growing hemlock variants. But the increasing difficulties of customs requirements and a war-torn Europe have practically eliminated this source of supply for the present.

The Arboretum, with its careful records of the origin, characteristics and growth of its trees, is qualified as a laboratory for scientific work; and as a matter of fact, it has been so used.

The pleasure of founding the Arboretum and collecting and caring for the hemlocks has been inestimable. It has brought many contacts with persons of like tastes and interests. Not a visitor comes who does not add to the stock of information and inspiration. It has been a pleasure to be able to distribute scions, seeds and plants to other enthusiasts in the hemlock world. The list of readers of the Bulletin, which is distributed with-

out cost, has grown until it now numbers over 800. Practically all of these have requested to be added to the list. There is always room for one more name. In order to import trees from abroad it was necessary to fulfill the requirement of the Department of Agriculture that the Arboretum be open to the public. This provision still holds. To make the Arboretum more interesting to casual visitors a border of hollies and dogwoods in some 24 varieties has been planted. We have a dove-tree, a species which Ernest H. Wilson pronounced "the most interesting tree in the temperate zone"; also large specimens of the lost Franklin tree, a sacred Glastonbury thorn, and other trees with special stories connected with them. The latch string still hangs out, and visits from kindred enthusiasts are appreciated.

Unusual variety of hemlock

Author photo



ANNUALS

Nellie B. Allen

NO other plants have been so blessed by Nature in variety and gaiety of color, in charm of varied foliage, form of growth, height and habit, and in long succession of bloom, as the annuals. They seem to have sprung from the earth in remote zones of variable climate; and as world travellers their seeds respond to friable soil wherever they are planted. They are the best assets for the greatest number of gardeners. From seeds sown either under glass or out-of-doors, according to location and climate, they give flowers from early summer till late fall. The cost of a seed packet is little for the large amount of flowers that results. With understanding care, they grow rapidly to blooming stage; and as cut flowers, the more they are picked the greater the supply for home, hospitals, church, and friends. They transform the simplest home into a little garden of color and fragrance, in window boxes at the front of the house, and in larger boxes built up from the ground against the wall or fence, where the lot is small.

If space is not available for an annual garden, the house terrace can be given a garden atmosphere with long low boxes placed to follow the front line of the terrace, and filled with any choice of annuals. Or small tubs may be planted with giant zinnias, Lavatera (mallows), or Heavenly Blue morning glories trained on wire frames. In contrast, large pots may be used for heliotrope, petunias, Lilliput zinnias, mignonette, zonal geranium, or small bushes of the sweet-scented geranium Dr. Livingston. A good loam soil with adequate drainage is the important requirement in this planting; overfeeding tends to produce lush growth, abundant foliage and fewer flowers.

Annuals can be adapted for mass planting where brilliant color is desired, both

in private gardens and in public parks. They are of the greatest importance for cutting; and if there is not space for a picking reserve, they can be planted between rows of vegetables, or as borders along the vegetable garden paths. Nothing could be more enjoyable and dependable than a garden of pure annuals, where the colors can be mingled according to your choice and preference. It can be a riot of color, or a subdued mixture of pastels. A yellow garden, for example, could include the fine degrees of strong and delicate tones of orange, amber, deep yellow, and lemon; mahogany hues of marigolds, zinnias in soft buff and cream, with a touch of red gaillardia Burgundy, and cream-yellow snapdragons. It would paint a picture to satisfy every lover of the color. Since colors and varieties of the annuals have advanced to such perfection and adaptability, their greatest value may be in filling the spaces that appear when such plants as spring bulbs or oriental poppies die to the ground.

In the front the bare spaces are planted with the adjustable low-growing annuals, from pots or flats. The disappearance of late May and June bloomers will leave other vacant spaces to be filled. At this time most of the annuals are planted to give the garden a succession of bloom. The color and form of the annuals and their adjustment with their perennial neighbors must be carefully considered. Above all, give ample room for the annuals' further growth with no crowding. Keep the color plan of the perennials in mind, and arrange to carry the *same* tone in the annuals, so that harmony may be maintained. This plan may not hold along the front edge of the border, as low-growing annuals must be used there, and their colors are limited. The following suggestions may be helpful as to what can be done for the bare spaces.

Tulip beds: plant Heliotrope Royal Fragrance, with a border of Verbena May-flower; or white annual Vinca with border of Ageratum Blue Cap.

Tulip spaces among perennials: Sweet Alyssum Little Gem and Violet Queen.

Archusa azurea: cut back and plant *Cynoglossum amabile* Blue Bird.

Canterbury bells: remove, plant Lilliput zinnias, flesh and white.

Columbine: stands well; later plant sparingly Browallia Sapphire.

Delphinium: cut back flowering stems; plant annual larkspur raised in pots for this purpose.

Foxglove: cut back, plant *Salvia farinacea* Blue Bedder 1 foot apart.

Hollyhocks: cut back, plant Cleome Pink Queen, 1½ feet apart.

Heuchera: plant with *Viscaria* Blue Bouquet.

Lupine: plant double white Shirley poppies.

Oriental poppies (died down): plant Zinnia Miss Willmott.

Sweet William: cut back, plant Ageratum Blue Bedder.

Valerian: cut back, plant Zinnia Salmon Rose and Isabellina.

Raising annuals from seeds is a simple process. Details of their handling and correct cautions regarding climate restrictions are included, with professional authority, in the cultural notes of all the first class seedsmen's catalogues; and so these will be omitted here. Most gardeners know their soil and its possibilities.

The ideal way to prepare the soil for planting in the open is to spade 18 inches deep and liberally mix in cow manure, stable manure, or leaf mold, which supplies the needed humus. The amount of watering depends upon the weather. Since the roots have more time to develop slowly in the cool of the North, it is there that you find the finest blooms and the strongest growth. The plants should not be allowed to bear seed, as this exhausts them and shortens the season of bloom. Plants that are to fill bare spaces among perennials are first pricked out into



Courtesy of Burpee

Giant Ruffled Tetra Snapdragons

a flat; later transferred to a second flat; next, potted firmly; and finally, lifted and planted into the space with no shock to the roots. Immediate growth will then follow.

There have been no special novelties in the past year. The All American Gold Medal winner, the perfect single French marigold Flash, will continue in popularity. The rose petunia All Double America has the appearance of a dwarf rose in the garden. Another fine new petunia is a single dwarf one called Cheerful, a charming clear salmon pink with a deeper rose veining toward the throat.

Cleome Pink Queen, the hybrid spider plant, runs clear in its refreshing true pink, and provides a harmonious back filler among perennials with *Salvia farinacea*. The single hollyhock Indian Spring has great charm, but must be sown under glass in early February for late July or August bloom. *Hibiscus Manihot* Sunset, which has very delicate yellow-cream flowers, is not a novelty, but is a strong back filler.

Here are a few annual beauties of my choice, regardless of location and climate. It is not an inclusive list.

Ageratum Blue Ball: dwarf.

Alyssum Little Gem: white, for borders.

Alyssum Violet Queen: keep shearing for bloom until frost.

Antirrhinum Rosalie (snapdragon): deep rose.

Antirrhinum Shasta: white.

Aster English Southcote Beauty: single, all colors.

Aster Giant California, Sunshine: all colors.

Browallia Sapphire: summer and autumn bloom; 14 inches; allow for branching.

Candytuft Giant Hyacinth: 1 foot; white, rose, pink, lilac.

Centaurea americana (basket-flower): 3 feet, lavender-blue, soft, thistle-like.

Centaurea americana var. alba: most mystic bloom.

Centaurea candidissima (dusty miller): gray silvery velvet leaves.

Centaurea Cyanus (bachelors-button): double, blue, white, rose; old favorites.

Clarkia: mauve, rich pink.

Cleome Pink Queen (spider plant): orchid-like flower, very fine.

Convolvulus minor (dwarf morning glory)

Royal Ensign: deep bright blue, with white throat; sun lovers.

Cosmos Purity, New Giant Early.

Cynoglossum amabile (Chinese forget-me-not): purest blue, 18 inches.

Euphorbia variegata (snow-on-the-mountain): green leaves, edges white.

Hollyhock: ever-blooming single.

Larkspur Blue Spire; Carmine King; White.

Lavatera alba: white; and Loveliness: pink.

Lobelia: all shades.

Lupinus subcarnosus (Texas blue bonnet): lovely blue and white.

Marigold, African, Yellow Supreme: softest yellow.

Marigold, French singles: dwarf.

Marigold (*Tagetes signata pumila*): dwarf and charming.

Matricaria capensis (feverfew): white and Improved Golden Ball: sulphur.

Mathiola bicornis (night-blooming sweet scented stock): flesh, white.

Mignonette Machet: most fragrant; a low plenty of room for spreading.

Moonflower: white, 20–30 feet, climber.

Myosotis Sutton's Royal Blue: spring bedder with tulips.

Nemesia: blue, cream, rose, yellow.

Nemophila insignis (baby blue-eyes): California wild flower, purest blue, an precious.

Nicotiana affinis (sweet-scented tobacco plant): white.

Nigella Miss Jekyll: ice-blue flower.

Pansy Swiss Giants and Baby Delight: dwarf violet-blue beauty.

Petunia Balcony Cornflower Blue, Rose Morn, Snowstorm, Violet Queen.

Phacelia campanularia: purest blue.

Poppy Double Shirley, Rhyburgh Hybrid: white, 3 feet, and fine.

Poppy Single Shirley and Wild Rose.

Ricinus (castor bean) Crimson Spire.

Salpiglossis: plant Violet Blue with *Saxifraga horminum*, lilac to purple.

Scabiosa Azure Blue, Black Prince Cherry, Salmon Beauty.

Sweet Pea:

Bridesmaid, pink.

Gardenia, fragrant, white.

Tahoe, chicory blue.

Verbena gigantea: white, and blue.

Verbena Mayflower: clear soft pink, fine foliage, propagated by cuttings.

Verbena venosa: reddish violet, carpet with dwarf Ageratum.

Vinca (periwinkle): white, perfect bedder, deep green foliage.

Zinnia, California Giant:

Enchantress, purest pink.

Isabellina, cream buff.

Lemon Queen, orange lemon.

Miss Willmott, flesh.

Pink Profusion, shrimp pink.

Rose Queen, deep rich rose.

Zinnia, Giant Dahlia type, Polar Bear.

Zinnia, Lilliput: flesh and white.

WITHIN THE BROOKLYN BOTANIC GARDEN

THE ELLEN EDDY SHAW FELLOWSHIP

Miss Elizabeth Hess, of Barnet, Hertfordshire, England, arrived in New York on the Queen Elizabeth on February 2, to spend a year at the Brooklyn Botanic Garden. She is the first recipient of the annual fellowship that was recently established at the Garden in honor of Miss Ellen Eddy Shaw, who retired last September, after thirty-two years as the first Curator of Elementary Instruction.

The fund that made this fellowship possible was started by the Woman's Auxiliary of the Botanic Garden and has been increased from time to time by gifts from Miss Shaw's friends, and more recently by efforts of the Auxiliary. The purpose of establishing such a fellowship is two-fold: first, to bring to Brooklyn promising graduate students from this country or abroad whose interest in education and training in botany or horticulture will contribute to the scientific and educational work that the Garden can do; second, to offer these young people a variety of experiences through the unique program of the Garden, and pre-

pare them to establish and conduct similar projects in other places.

Miss Hess has had a distinguished career in horticulture, and during the war has given outstanding service to the British government in connection with the program of food production. As an adviser and organizer of the Produce Guild she has travelled throughout England and Wales for the National Federation of Women's Institutes. Before the war she was instructor and lecturer at the Swanley Horticultural College in Kent, England. Miss Hess has long been interested in the practical program of garden work for children that is offered in Brooklyn and, because of her interest, Miss Shaw recommended to the committee that she be the first to receive this fellowship. She will augment the staff of the Department of Elementary Instruction, engage in some research work, and lecture to adult groups as well as children.

The Ellen Eddy Shaw Fellowship is the first to be established at the Botanic Garden.

THE MESSAGE OF FORSYTHIA, BROOKLYN'S OFFICIAL FLOWER

Mrs. Edward C. Blum, one of Brooklyn's most public spirited women, who is ever thinking of the welfare of her city, has presented to the Brooklyn Botanic Garden an endowment fund the income of which will enable it to observe an annual "Forsythia Day". Mrs. Blum inaugurated and for several years has sponsored the "Forsythia for Brooklyn" movement, so that this beautiful shrub with the golden bells has been adopted as Brooklyn's own, as proclaimed by Borough President John

C. Cashmore. With the cooperation of Commissioner Robert Moses and Park Director R. C. Jenkins extensive plantings have been made in the parks of Brooklyn. Beautiful specimens may be seen in the Botanic Garden on the hillside near the Eastern Parkway Gate, in the Horticultural Section nearby, and along the border mound near Flatbush Avenue in the southeast part of the Garden.

Following is Mrs. Blum's spiritual message for Brooklyn's own flower as quoted from the Brooklyn Daily Eagle for Feb. 3, 1946:—

"Some have asked how Forsythia, Brooklyn's flower, can help in the reconstruction period.

"Just think that the planting of a tiny seed can and does bear fruit of untold promise. How? Let us stand in contemplation before our beautiful flower, Forsythia, God's handiwork. Do you hear its message? It is whispering to us now and this is what we hear:

"Feel His presence, His love.

"Always have a friendly greeting for the stranger, the lonely one.

"Feel the urge to be of greater service to your fellow man.

"Be tolerant, be kind."

"This is the spiritual message it should have for all of us. How wonderful to

have our own Brooklyn flower inspire us all with thoughts such as these. Just think, if every city in the world would declare for itself an official flower adapted to its climate, and imbue it with this same spiritual message, can you not see how every day, yes every hour all over the world, a flower could inspire all peoples?

"Would you not agree that our march toward a better world will have started?"

Mrs. Blum for many years has been a member of the Woman's Auxiliary of the Garden and a thoughtful and generous friend. Her husband, Mr. Edward C. Blum, has been prominent in the activities of the Brooklyn Institute of Arts and Sciences, long serving as President and, for the past eight years, as Chairman of its Board of Trustees.

It is a pleasure for the Garden to accept the responsibility of perpetuating Mrs. Blum's message through the observance of Forsythia Day.

Forsythia in the Garden



EDUCATIONAL ACTIVITIES AT THE GARDEN

HOUSE PLANTS

To garden-minded people the growing of house plants is the continuation of gardening—in the home. Plants have likes and dislikes and require attention; sometimes a few are more particular than other hardier types. The House Plant course given at the Brooklyn Botanic Garden endeavors to clarify the situations that might arise.

This year it was decided to have one section of the class at night so that persons employed would be able to attend. The experiment proved just as successful as the regular morning section. In the greenhouse each person worked with plants and prepared bulbs for forcing. Each made cuttings of a few choice plants and was able to watch their progress until they formed roots and were large enough to be potted and taken home.

One lecture was given over to the study of the various plants that are reliable for indoor culture. The Club Room seemed an ideal place to display them. Each window represented a different exposure and on the window sill were the plants best suited to that situation.

FLOWER ARRANGEMENT

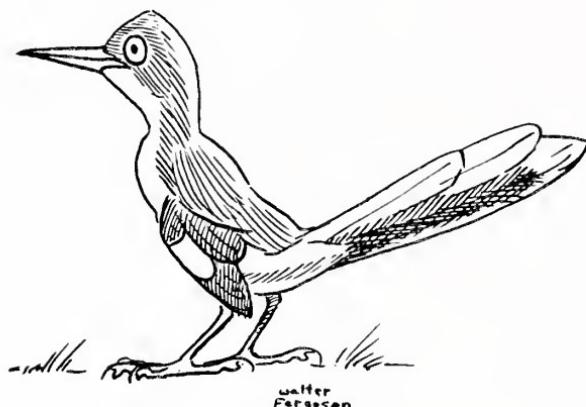
Winter at the Garden was highlighted by the Flower Arrangement course conducted by Dr. Conrad B. Link, Horticulturist of the Garden. A record group of 150 people attended—garden club representatives and individuals from the New York City region. Designed primarily for those who wish to arrange flowers for enjoyment and decoration in their own home, the lectures and demonstrations emphasized the practical, rather than the elaborate flower-show type of arrangements. Hearty thanks go to Mrs.



House plants at a west window

Charles Doscher, past president of the Federated Garden Club of New York State and Mrs. John C. Parker, president of the Woman's Auxiliary of the Brooklyn Botanic Garden for their civic-minded efforts in publicizing this course.

FEATHERED FRIENDS



Mocking bird

Although many bird lovers in the vicinity of Brooklyn are familiar with the fact, it may surprise others to know that the Botanic Garden, located in a busy, populous section of the city, is an excellent place to study birds. Approximately 125 different kinds may be seen in the course of the year. Probably the extensive plantings of shrubs, affording shelter and food, and the always available water supply, account for the popularity.

The winter birds are especially interesting, and almost any day the fox, song,

and white throat sparrows, juncos, blue jays, crows, and sparrow hawk may be seen, and of course English sparrows and starlings. Frequently robins, hermit thrushes, catbirds, and grackles spend the winter. Occasionally an unexpected kind appears to brave the winter in the Garden. There have been a saw-whet owl the cardinals, a brown thrasher, and during the past winter a mocking bird has made its home here.

ARTHUR BIERMAN



Winter wren



Saw-whet owl

AMONG THE CONTRIBUTORS TO THIS ISSUE

NELLIE B. ALLEN is a New York Landscape Architect.

LAURA L. BARNES is Director of the Arboretum of the Barnes Foundation, Merion, Pennsylvania.

STANLEY W. BROMLEY is a member of the Staff of the Bartlett Tree Research Institute of Stamford, Connecticut.

JANET DARLING is a New York Landscape Architect, a graduate of the Cambridge School of Architecture.

HENRY E. DOWNER has long been Horticulturist and Superintendent of Grounds, Vassar College, Poughkeepsie, New York.

JOHN W. HERSHIEM is proprietor of the Nut Tree Nurseries, Downingtown, Pennsylvania.

CHARLES F. JENKINS, retired publisher, a long prominent Philadelphia citizen and amateur gardener.

H. GLEASON MATTOON, Secretary of the Pennsylvania Forestry Association, is a Consulting Forester.

ARTHUR F. PAUL is President of Andorra Nurseries, Conshohocken, Pennsylvania.

E. A. PIESTER is Assistant Superintendent of Parks, Hartford, Connecticut.

HARRIS A. REYNOLDS is Secretary of the Massachusetts Forest & Park Association.

GERTRUDE M. SMITH is a Garden Consultant in Montclair, New Jersey.

DR. DONALD WYMAN is Horticulturist of the Arnold Arboretum.



PLANTS & GARDENS

Summer, 1946

A Year-round Garden

—
Roses

—
Wall Gardens

—
Conference
on
Community Planting
for
Civic Beauty

—
2-4-D Developments

—
Street Tree Care



BROOKLYN BOTANIC GARDEN
OF
THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

Officers of the Institute

EDWARD C. BLUM

Chairman, Board of Trustees

ADRIAN VAN SINDEREN

President

WALTER H. CRITTENDEN

First Vice-President

CHARLES PRATT

Second Vice-President

SIDNEY W. DAVIDSON

Third Vice-President

EDWIN P. MAYNARD

Treasurer

JAMES E. GIBBONS

Secretary

Ex Officio Members of the Board

The Following Officials of the City of New York

THE MAYOR THE COMPTROLLER

THE COMMISSIONER OF PARKS

Botanic Garden Governing Committee

PHILIP A. BENSON, *Chairman*

MISS HILDA LOINES, *Vice-Chmn.*

WALTER HAMMITT

EDWARD C. BLUM, *Ex officio*

WILLIAM T. HUNTER

WILLIAM G. CREAMER

EDWIN P. MAYNARD

WALTER H. CRITTENDEN

LEONARD P. MOORE

LEWIS L. FAWCETT

ROBERT MOSES, *Ex officio*

MRS. LEWIS W. FRANCIS

JOHN C. PARKER

ANDREW J. GONNOUD

DONALD G. C. SINCLAIR

ADRIAN VAN SINDEREN, *Ex officio*

Director of the Botanic Garden

GEORGE S. AVERY, Jr.

PLANTS

GARDENS

Early-flowering cherry, *Prunus subhirtella*

NEW SERIES

Summer, 1946

VOL. 2—No. 2

CONTENTS

Cover.....	Tree Rose—Miss Flora Mitten	
Frontispiece.....	Rose Garden of the Brooklyn Botanic Garden	66
Director's Letter.....		67
A Year-round Garden.....	Mary Deputy Lamson	68
<i>Articles on Roses:</i>		
Rose Species.....	Henry K. Svenson	72
The Rose as a World Plant.....	J. Horace McFarland	77
Old Garden Roses	Gertrude Albion Wright	79
Outstanding New Roses.....	Eugene S. Boerner	85
Hardy Enduring Roses.....	John C. Wister	87
Roses for Severe Climates.....	Richard S. Wilcox	90
Hardy and Healthy Roses.....	Walter and Josephine Brownell	93
Rose Testing.....	C. Eugene Pfister	97
Old Roses.....	Ethelyn E. Keays	98
How to Grow Roses of Exhibition Quality.....	John B. Carson	100
Maintenance of the Rose Garden.....	Gertrude M. Smith	103
How to Grow Roses in the City.....	Sidney R. Tilley	107
Use of Embryo Culture in Rose Breeding.....	Walter E. Lammerts	111
<i>Miscellaneous Articles:</i>		
Wall Gardens.....	Dorcas Brigham	112
How to Help Street Trees.....	Carl J. Schiff	115
Recent Advances on the Weed-killing Front.....	George S. Avery, Jr.	117
Grafting: New Information from an Old Practice.....	Ray F. Dawson	119
Within the Brooklyn Botanic Garden.....		121
Conference on Community Planting for Civic Beauty.....		121
New York Flower Show Exhibit.....		126
Among the Contributors to this Issue.....	Page 3 of cover	

Except where otherwise noted: drawings by Maud H. Purdy,
except the one on page 120, which is by Margaret F. Piper;
photographs by Louis Buhle.

JOHN C. WISTER, *Editor*

Published quarterly at Prince and Lemon Streets, Lancaster, Pa., by the Brooklyn Botanic Garden, Brooklyn, N. Y.
Entered as second-class matter, May 26, 1945, at the post-office at Lancaster, Pa., under Act of August 24, 1912.
Subscription included in Botanic Garden membership dues. To others: \$2.00 per year; \$3.00 for two years.
Copyright, 1946, by the Brooklyn Botanic Garden.



Rose Garden of the Brooklyn Botanic Garden

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN 25, NEW YORK

Summer, 1946

SUMMER is in the air, and we are proud to bring you this important number of PLANTS & GARDENS. It is about roses, probably the most widely known single group of plants in the world. Any plant that combines thorns with fragrance and great beauty, deserves our lasting interest. In thirteen authoritative articles you will find the "hows" and "whys" of roses, their culture, and their place in the sun.

Civic minded readers should turn without delay to the section "Within the Brooklyn Botanic Garden." Here, in short form, is a report on the first postwar Conference on Community Planting for Civic Beauty, held at the Garden in April. There are suggestions galore and it is our hope that they will fall into good hands.

Do not let Dr. Dawson's article on grafting escape your attention. He reports some interesting and significant new work; give your imagination free rein after reading it!

2-4-D continues to be in the news, and the weed-killing items reported in this issue are fresh from researchers.

NEWS FOR INQUIRERS: What is the relationship of the Brooklyn Botanic Garden to the Brooklyn Institute of Arts and Sciences?

This question comes fairly frequently from far places and near, and you may have wondered, too. The mystery is not answered on the inside cover page of PLANTS & GARDENS; the Institute is a hundred-year-old cultural organization, now made up of three operating divisions, the Botanic Garden, the Brooklyn Museum, and the Academy of Music. The last named is Brooklyn's "Town Hall," and if you would like to see its program for the past season (some offering!) send a card to me here at the Garden. The Institute as a whole is a private corporation with some five million dollars of endowment; the Garden receives a share of the income.

Sincerely yours,

George S. Avery, Jr.
Director



Richard Averill Smith

Tulips in the Garden in Spring

A YEAR-ROUND GARDEN

Seclusion and Beauty, Summer and Winter

Mary Deputy Lamson

THIS small garden in a near-by suburb is in full view of the living room and library windows and must be attractive 12 months in the year. In a corner of an irregularly shaped property, it has a street immediately behind it and a large house on the left. To meet these difficulties and still get the seclusion and repose that are the charm of any garden, both the design and the plant material

of the garden had to be worked out in fine detail.

Every plant in the shrub border around the garden serves these purposes. Each one serves as a screen, winter and summer, for the street and neighboring property; as a background for the oval garden itself; and as a considered part of the color scheme, with the shrubs and herbaceous plants in careful combinations.

The heavy planting needed to screen the street has Carolina hemlocks and pines for the winter effect. With them are broad-leaved evergreens, holly, rhododendrons, and laurel, with drooping



Richard Averill Smith photo

A Garden in Winter

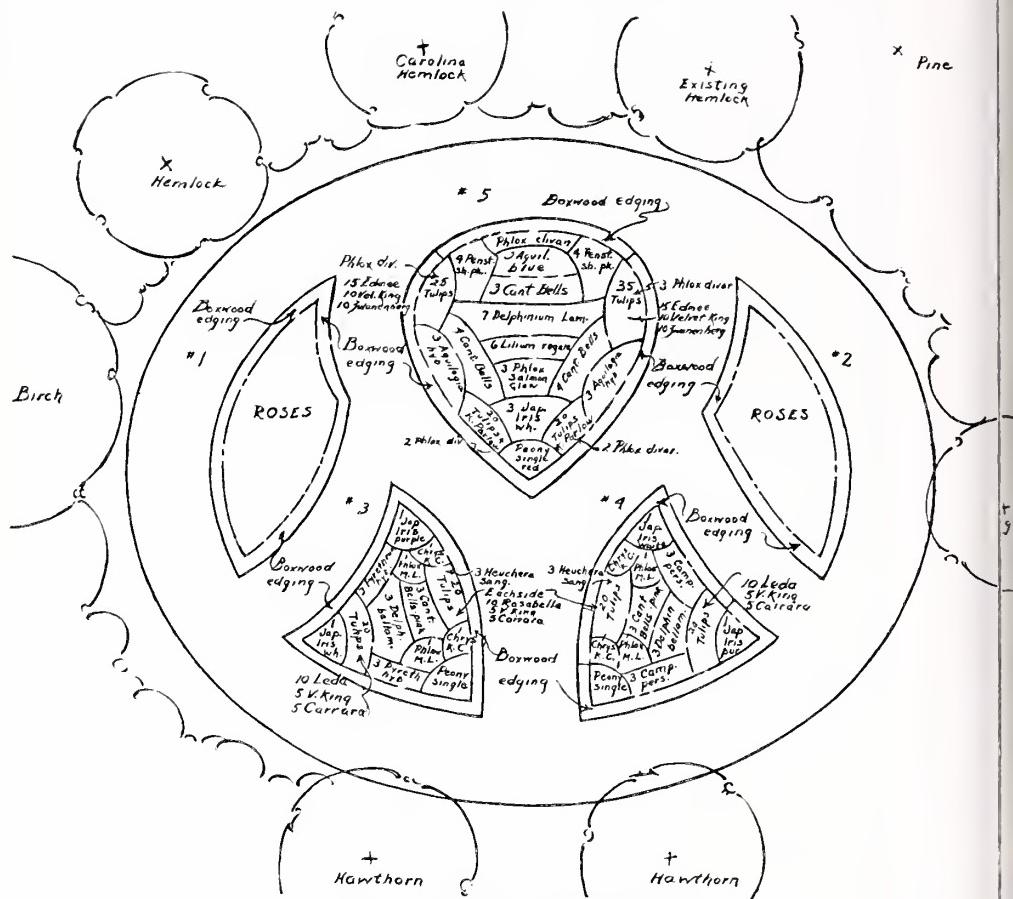
leucothoe in the foreground. The trunks of a birch seem extraordinarily white against the evergreens.

Deciduous azaleas, *Rhododendron Vaseyi*, *nudiflorum*, *arborescens*, under flowering dogwood (*Cornus florida*), *Viburnum tomentosum*, *Cotoneaster divaricata*, and *Viburnum Carlesii*, add to the flower mass all through May and early June. All the shrubs are chosen for their interesting habit in the leafless months, and their clean, contrasting foliage in the summer, as well as their blossom.

Under these the paler yellow varieties of narcissus, *N. Barri* and *Leedsii*, and the white poet's narcissus start the spring.

The beds of the garden are bordered with dwarf box (*Buxus sempervirens suffruticosa*) to give them the neatness and pattern so desirable in so small a garden. (It's only 25 × 36 feet.) In the winter it is protected from burning by evergreen branches carefully placed so that the outline of the garden is still visible against the snow.

The tulips in the garden are varieties that blend with the pink hawthorns (*Crataegus oxyacantha rosa*) that form the entrance, and with the pink and white of the azaleas and dogwoods. Single peonies, medium-height German iris, sweet William, Japanese iris are all in scale with the size of the beds. The



A Year-round Garden Plan

By the author

tulips and sweet William are followed by snapdragons, dwarf petunias, and small zinnias for midsummer and fall bloom. The 2 outer beds are low-growing floribunda roses with a few hybrid teas in the center of each one. In September any shabby annuals are replaced by chrysanthemums, which grow through the summer in a narrow sunny border behind the picket fence.

The smaller the garden, the more perfect its detail must be at all times. The owner of this one is an ardent and skillful gardener, so that it has the meticulous

grooming and care necessary for its success.

PLANTING LIST FOR FLOWER GARDEN

PERENNIALS

- 3 Aquilegia, blue—blue columbine
- 6 Aquilegia hybrids—mixed columbine
- 4 Aster Victor—dwarf blue aster
- 6 *Campanula persicifolia*—peach-leaved bellflower
- 6 *Campanula Medium rosca*—pink Canterbury bells

- 11 *Campanula Medium*, mixed—Canterbury bells
 4 *Chrysanthemum King Cushion*—dwarf bronze
 6 *Chrysanthemum Louise Schling*
 5 *Chrysanthemum Ceres*
 6 *Chrysanthemum Diana*
 6 *Delphinium Belladonna*—dark blue delphinium
 7 *Delphinium Lanmartinii*—gentian-blue delphinium
 10 *Dianthus barbatus*, white—white sweet William
 10 *Dianthus barbatus*, red—red sweet William
 6 *Heuchera sanguinea*—coral-bells
 9 *Iris Kaempferi*, white—Japanese iris, white
 6 *Iris Kaempferi*, purple—Japanese iris, purple
 8 *Lavandula vera*—lavender
 8 *Penstemon Pink Beauty*
 12 *Phlox divaricata*—blue wild phlox
 4 *Phlox Miss Lingard*—early white phlox
 3 *Phlox Salmon Glow*—salmon phlox
 1 Peony, single red
 2 Peony, single
 6 *Pyrethrum hybridum*—painted daisy
 12 *Spiraea Filipendula*—meadowsweet

BULBS

- 6 *Lilium regale*
 72 *Scilla campanulata*
 Tulips (Bed 5)
 30 Eclipse
 20 Carrara
 20 Lemon Queen
 40 Kathleen Parlow
 Tulips (Bed 3)
 10 Rosabella
 10 Aphrodite
 10 Velvet King
 10 Carrara
 Tulips (Bed 4)
 10 Rosabella
 10 Aphrodite
 10 Velvet King
 10 Carrara

ANNUALS

- Alyssum Carpet of Snow
 Ageratum Blue Ball
 Salvia Blue Bedder
 Petunias, purple
 Zinnias Spun Gold
 Zinnias double dwarf salmon
 Zinnias double dwarf white

Rose-covered Terrace and Pergola in the Brooklyn Botanic Garden



ROSE SPECIES

Their History and Geography

H. K. Svenson

Illustrations from "Illustrierte Flora von Mittel-Europa" by Dr. Gustave Hegi published in 1923.

THE number of species of roses in the world varies from 30 to several hundred, depending upon the limitations which the individual places upon "species." All of them, however, are confined to the Northern Hemisphere, extending southward to Abyssinia and New Mexico. Roses, together with their relatives, the blackberries and the hawthorns, are adept at pioneering. The thickets formed by roses and blackberries are just as difficult to penetrate as the long-spined thickets which hawthorns make.



Rosa multiflora

Native American Roses

With the exception of the beautiful prairie rose (*Rosa setigera*) none of the native American roses is grown extensively in gardens. Some of the eastern wild roses (such as the common pasture rose and the swamp rose) have run wild in localities in Europe; they are rarely seen in cultivation but nevertheless are attractive, or more so, than some of the cultivated sorts. To me the single roses are more interesting than the double forms. Western United States has a number of species which have come into cultivation, especially *Rosa californica*.

Old World Roses

It is to the Old World species that we owe practically all of our cultivated roses and the great majority of these are from Asia. The great center of rose distribution is from the eastern Mediterranean to



Crimson Rambler



Rosa alba

the mountains of China. The region from northern India to western China—the richest area for flowering plants in the temperate zone—is also the richest in roses. Only a few Asiatic rose species have as yet come into cultivation, but by crossing these with European roses the great majority of our garden forms have originated. Albertus Magnus (1206-1280) wrote of five species of roses, as they are recognized by modern names: *R. alba*, *R. arvensis*, *R. rubiginosa* (the sweet brier), *R. canina* (the dog rose), and *R. centifolia* (the hundred-leaved Rose).

Of these *R. alba*, presumably a wild species of Asia, but cultivated in Europe

from ancient times, is perhaps a hybrid of *R. gallica*. *Rosa arvensis* is an "Atlantic species," that is, it ranges from the Balkan Peninsula to Ireland in the warmer southwestern area of Europe, much as does the arbutus tree, which extends northward into the Killarney region of Ireland. *R. alba* is a species with snow white flowers grown as far north as the River Tweed in Scotland. From it have come Ayrshire roses, which originated at Loudoun Castle in 1768 from seed supposed to have come from Nova Scotia.

The sweet brier (also known as *R. Eglanteria* and the "eglantine" of Shakespeare) is abundant in various forms from northwest India to Great Britain and Spain. It has become abundantly naturalized in northeastern United States



Rosa turbinata



Rosa damascena

in pastures and fields. The leaves have a strong fragrance.

The name "dog rose" for *Rosa canina* probably comes from Dioscorides' *kyno rhodon*, i.e., "dog rose," but it may also have been applied by early North Europeans to wild roses in general in distinction to cultivated roses. It is a pink-flowered rose resembling our wild roses, which occurs in nearly all of Europe and extends southward to North Africa.

The hundred-leaved Rose, referring to the large number of petals, is also known as the "cabbage rose." It was first mentioned by Herodotus, and was said to have come from Macedonia. This species and *R. alba* appeared in northern Europe at about the end of the 16th century. *R. centifolia* has been cultivated in the Orient for centuries. The moss rose, a peculiar variation in which the glandular structures become branched and moss-like (see illustration) has been known since the Middle Ages. Like other forms of this once "Queen of the Roses" the moss rose would probably have disappeared from cultivation, except for the sentiment attached to it.

Rosa moschata (musk rose) has been cultivated in the Mediterranean region since ancient time, and is a source of rose-oil in the North African region. It is the most characteristic rose of the Himalayas and extends westward to southern Europe and North Africa. The musk rose was known to Theophrastus. It was introduced into England at the time of Henry the Eighth, and has been hybridized with many other kinds of roses. Among these hybrids are the Noisette Roses (*moschata* x *chinensis*) which were produced by Philippe Noisette at Charleston, South Carolina, in 1816, and sent to his brother Louis in Paris. The Damask rose is thought by some to be a hybrid of *R. moschata* and *R. gallica*.

The Damask rose (*R. damascena*) has been known from antiquity, and was in cultivation in Italy, along with *R. centifolia* and *R. moschata*, as early as 1520.



Rosa centifolia



Rosa chinensis

It was brought from Syria, and even at that time was quite evidently a much-cultivated rose. The York-and-Lancaster rose has red and white flowers on the same bush and appears to be a chimaera, that is, a plant with a mixture of tissues of different strains.

Another rose of very early cultivation in Europe is the cinnamon rose (*Rosa cinnamomea*), so called from the fragrance of the flowers. Clusius already knew it in cultivation in 1583. Next to the Scotch rose (*R. spinosissima*) it occupies the widest geographical area of any of the roses, extending from western Europe to Siberia and Japan. It may sometimes be found escaped from cultivation in eastern United States.

The Austrian brier (*Rosa foetida*) has been frequently cultivated since the 16th century and was known with double flowers by Clusius as early as 1601. It is native from Armenia to Tibet. A variety, Persian Yellow (introduced into Europe in 1828 from Teheran), was crossed by Pernet-Ducher with a Hybrid Perpetual giving rise eventually to the

Pernetiana strain of Hybrid Tea Roses. These have a great range of yellow coloration.

Perhaps most important of the early-cultivated European roses is *Rosa gallica*, the French rose, which is wild in central and southern Europe and extends to the Caucasus. It hybridized freely, and was grown, together with tulips and hyacinths, by the pioneer Dutch gardeners. As one may see by glancing over this account of roses, it takes a part in the ancestry of many garden roses. Miss Willmott calls *Rosa gallica* the Provence rose, and says that it should not be confused with the Province Rose (*R. provincialis*), a plant that has also been grown in France and England for a long time, and which she believes to be a variety of *R. centifolia*. Gerard mentions that he grew the Province rose in 1596; it is supposed to have been brought from the Orient to the town of Provins in France by the crusader, Robert de Brie.

Rosa canina





Rosa tomentosa

Roses from China and Japan

We have now covered the rose species grown horticulturally in Europe in the early days, and for our next chapter we must turn to the Far East, to China and Japan, now being opened to maritime trade with the European countries.

One of the earliest of these Oriental roses to appear in Europe was the Blackberry rose (*R. multiflora*) which in the arrangement of the terminal clusters of small flowers suggests the inflorescence of our common blackberries. Native to Japan and Korea, it has been known in Europe, on the basis of botanical specimens, from as early as 1700. It had already been under long cultivation by the Japanese. The single white-flowered form is the typical plant, but forms with double pink flowers were introduced into England as early as 1804. The species was later described by Siebold & Zuccarini in their "Flora of Japan" as *R. polyantha*, and one of these Polyantha forms (probably crossed with *R. chinensis*) is the Crimson Rambler. Originally it was known as "The Engineer," having been sent to England in 1878 by R. Smith, Professor of Engineering at Tokio, but later it was marketed under the name "Crimson Rambler."

Perhaps the most important is *R. chinensis*, which is the most popular of all roses and the parent stock of a large proportion of our garden roses. Nothing is known of its early history, but it is known from herbarium specimens as early as 1704, and was definitely introduced into England by Sir Joseph Banks in 1789. As a wild plant, the typical China rose is known only from Ichang in Central China. The Bengal Rose (*R. bengalensis*), a variety of *R. chinensis* came to Europe in 1780 from Canton. Mention has been made of the Noisett Roses (*R. chinensis* x *moschata*). *R. chinensis* var. *minima* (*R. Latiflora*) is a dwarf form frequently grown in gardens. The Bourbon roses (*R. chinensis* x *damascena*) were discovered on the Island of Reunion (north of Madagascar), by M. Bréon, the Director of the Botanic Garden at Reunion, in 1817.

The beautiful Cherokee rose (*R. laevigata*) was described from southern United States in 1803, where it has established itself as a wild plant. But it actually comes from southern China and was described by Plukenet as early as

Rosa arvensis



1705, and brought into England before 1800. It is hardy in southern England, and has run wild in Madeira and in southern Africa.

The well-known *Rosa rugosa*, which is commonly planted along our seashores, is a native of the maritime districts from Japan to Siberia and China. It was brought to England in 1796.

The Banksian rose (*R. Banksiae*) first introduced into England in 1807, and named for Lady Banks, is one of the most beautiful of all roses, but is questionably hardy even in our southern States. It comes from the mountains of central and western China.

The tea rose (*R. odorata*) so named from the fragrance of the flowers, is often treated as a variety of *R. chinensis*. It was introduced into England from China in 1810, first the form with pink double flowers; then the double yellow.

Tea roses are not very hardy in the northern States.

The hardy *Rosa Wichuraiana* is a climber with small single flowers. It was named for the German botanist, Wichura, who accompanied an expedition to China and Japan in 1859-1861. Sent by Spaeth to the Arnold Arboretum in 1888, it was grown very successfully in Franklin Park in Boston. This "memorial rose" is very useful for covering banks.

This list includes perhaps the most important of our cultivated roses, but there are a number of additional European species, such as *R. tomentosa*, *R. turbinata*, *R. pomifera*, and *R. pendulina*, which might be mentioned. Also a host of beautiful and little-known roses from the mountains of western China will some day enrich our gardens.

THE ROSE AS A WORLD PLANT

Brief Characterization of the Chief Types of Roses

J. Horace McFarland

THE name "rose" instantly occurs to the mind when the world's most loved flower is mentioned. Botanically it is Rosa, and in every modern language the name is practically the same.

Roses grow wild all over the world, save in the deep tropics and toward the South Pole. They occur naturally far north of the Arctic Circle. Not long ago that great American plantsman, Dr. Liberty Hyde Bailey, reported seeing in certain tropical islands in the Caribbean, rose plants surviving rather unhappily, as as they had been brought from the cooler North.

The word rose has meant much both in prose and in poetry, and it is in the countries where civilization has flourished most that the most roses are found. As the botanist looks at it he says: "There are probably about 200 rose species, widely distributed in the Northern Hemisphere. A score of them have been much multiplied under cultivation, or have contributed to important hybrids. All members of the genus are important to the horticulturist, to be grown as ornamental shrubbery if not directly for bloom."

Rose Types

For the purposes of this article roses may be considered to include a number of different types. The hybrid perpetual

roses are shrub-like and suitable for garden backgrounds. They produce their main crop in early summer, and sparingly give some autumn bloom. The hybrid teas are of major importance in commerce as well as in the production of garden beauty. It was an historic event when great hybridizers formed combinations between hybrid perpetuals and teas.

The true tea roses came to us originally from China. They grow well on the Pacific coast and, if properly nurtured, in the southern States, but they are now commercially much less important than the hybrid teas.

The polyantha roses belong to the multiflora group. The tendency now is to include all shades, colors and habits under what is known as the floribunda class of this persistent-flowering, quite enduring group. Some shrewd rosarians believe they will come to outnumber the hybrid tea roses as time goes on.

From this multiflora group, but in complete confusion so far as exact origin is concerned, come the hardy climbing roses. These, when hybridized with the uniquely important Wichuraiana group, give us varieties which tend toward constantly recurring bloom as well as toward the

higher colors and richer display of all other classes.

Sweetbrier roses, which are far more popular in England than in this country have vigor and beauty. The Rugosa roses, of Japanese origin, provide us with plants of great vigor, sometimes tending toward recurrent bloom and especially adapted for use in hedges and in backgrounds.

Hardly to be more than mentioned in this survey are China and Bengal roses, the Banksias and the Cherokees and the Macartneys, all of more prominence abroad because less adapted to enduring the extremes of the American climate. Very dwarf are the dainty and quite hardy Rouletti roses, blooming early and often at our feet.

Rosa Hugonis, from China, is one of the earliest of roses to bloom. It and many other species are particularly suitable as great background shrubs.

This is a mere mention of some of the leading types of roses. There must be added the plain, insistent fact that the universality of the rose is genuine. It has been said that anyone may have a rose anywhere, if he will take trouble enough—and that trouble is sometimes great pleasure.

Climbing Roses



OLD GARDEN ROSES

Some Kinds that Everyone should Know and Grow

Gertrude Albion Wright

THE rose grower who does not know and grow many of the species and old garden roses is missing the simplest, sweetest, and most easily grown of roses. Hybrid teas are delectable, sophisticated, and subtle; and the most ardent fancier of old roses would be the first to give them their place of prominence. But there is no garden too small or too large for at least a few species of old garden roses.

Yellow Roses

It is possible to have early yellow or cream species from the middle of May, as well as a few pinks. *Rosa Primula* is an especial delight because it comes with the first warmish days, a very pale yellow, single of course because it is a species or wild rose. It grows to 7 feet and is frequently in bloom with the lilacs. A week later comes *R. Hugonis*, which most of us know, and about which too much can not be said. It is the Frau Druschki of the species. With *R. Hugonis* comes *R. spinosissima altaica* from the mountains of Central Asia. It is fully as large a bush as *R. Hugonis*, with blooms about twice the size, creamy white, flung with prodigality over a 6-foot bush. We like to grow it with *R. virginiana*, an American wilding which is a sweet soft pink, the blossom not quite so large as *R. s. altaica*, but on a bush that looks well with it. *R. xanthina* is another big-bushed one, which makes its appearance fourth in the procession of early yellow roses. *R. Primula* and *R. Hugonis*, singles a week apart; then Harison's yellow

and *R. xanthina*, double, come in the next two weeks. The succession starts with the palest lemon and finishes with *R. xanthina*'s brilliant butter color.

Pink Roses

Next I want to recommend a sprawling, scraggy rose with a very insignificant sickly little pale pink flower. Why? Because it comes at the same time as *R. Primula*, when you're bursting to see and smell a rose. You've pruned the hybrid teas and thinned out the floribundas, and you don't see how you can wait for a whiff of rose perfume. The yellows delight the eye, but their fragrance doesn't send you rushing excitedly into the house to tell someone about it. This scraggy one, *R. davurica*, whose appearance makes you wonder why anyone ever bothered to bring it from central Asia, does just that. You go out in mid or sometimes early May, and you know it is in bloom because of the heavenly fragrance that stops you in your tracks.

Many of the species do well in the background of the rose garden or in the shrub border; with *Ionicera* and *Philadelphus* they are lovely. If I weren't aware that I must show some regard for the use of adjectives I would pull out the stops for a rose one rarely sees outside a botanical garden, *R. micr rugosa*. It isn't strictly a species because it is a cross between two species, *R. rugosa* and *R. Roxburghii*; it doesn't look a bit like either, which is true of a lot of beautiful offspring. It grows about 3 feet for us, and has beautiful fairly fine foliage; but that is not what makes it a pearl of great price. Its flowers are the most lovely, pure, delicate rose pink, really blush; and they are as big as small butter plates, with 5 big soft petals that look as though there never had been such a



McFarland photo

Rosa Wichuraiana

thing as evil. Five minutes of gazing at *R. micr rugosa* will make you love your cantankerous neighbor, and walk back to the house a very humble rosarian. I am not exaggerating when I tell you it is so palpably a gift of God that you keep thinking about it all winter when the rose books and the spring catalogues pall. If a flower can be other-worldly, this one is. It doesn't matter if the tag gets lost, because once you've seen it you could never forget it.

Rosa micr rugosa blooms in early June as do dozens of wonderful species. Also there are dozens of species that aren't so very wonderful because they look so much alike. There is a whole tribe of *R. spinosissima*, all low rather rounded little bushes with white, yellow, or pink flowers. When ours have finished their month of blooming we plant bright annuals between them to lighten up the shrub border. The real queen of the *R. spinosissima* group is Stanwell Perpetual; it is no more perpetual than the hybrids of that name, but it does bloom off and on if it likes the spot you put it

in; the flowers are double, blush to rosy on the edges. In the early 19th century the English and Scottish gardeners went off the deep end on *R. spinosissima*, and the catalogues of the period show dozens of varieties. You can tell *R. spinosissima* by its fine foliage and black hips. These small ones are native in Scotland and tough; a low hedge of them would discourage the bravest dog, and no child is known to have crawled through, a recommendation in some localities.

Rugosas

Another species which would make a good impregnable hedge, though much higher, is *R. rugosa*. Its varieties can be had in many colors besides the hard magenta of the common sort which has discouraged many people. Agnes is a soft yellow, with hybrid tea flowers which grow in garlands. Conrad F. Meyer soars right up to 10 feet, with soft pink flowers, again like those of a hybrid tea. A fine double white is Blanc Double de Coubert, a *R. rugosa alba* sport. Dr.

Eckener is coppery rose and yellow, while Ruskin is a deep crimson. This species and its hybrids are too often neglected. Their perfume is intense; and some of them repeat, though not so profusely as in the spring blooming. Sarah Van Fleet, a soft pink, is reputed to bloom continually; ours is just beginning to learn that.

Unusual Kinds

For an out-of-the-way place where you can walk on a misty or rainy day there should be a *R. Eglanteria*; it's a coarse, barrier sort of bush with nice little pink flowers; its great virtue is that, when damp, the leaves smell like apples. *R. Moyesii* is one that always attracts attention; it came to us from western China, grows to 10 feet, has lovely almost fern-

like foliage, and (what is extraordinary for a species) it is blood-red to deep rose.

The Penzance roses aren't real species, but they don't fit into any category; and they are close to the species in appearance. They are low, with small dark fragrant leaves; the flowers are single, fawn, faint yellow, or coppery; they shouldn't be missed.

All the species and old garden roses bloom only once, usually in June. Why this is such a stumbling block to many growers I can not understand. Because the everblooming hybrid tea and the very hybrid floribunda have been developed is no explanation. Most rose gardens, especially small ones of a few hundred roses, are often so full of bloom that you can't see the roses. That is the great value of species, and particularly

Rosa Hugonis

McFarland photo



old garden roses, used in the background of the rose garden. In June the rose is queen. No one who loves roses and is honest, pays any attention to other flowers in June; and that is as it should be. In June all roses are going strong: species, old roses, hybrid perpetuals, Bengals, polyanthas, floribundas, hybrid teas, and climbers are solid with bloom. There are a few delirious weeks when one lives roses. But once June is over, the species and old roses rest, and make a quiet, very welcome background for their "prima-donna" offspring.

Species and Varieties

The old garden roses are even better suited to this purpose than the species, and it seems fitting that the parents and

Climbing Rose Los Angeles



grandparents, as well as collateral cousins, should be used as a backdrop to their spectacular children. Actually, in June, as our visitors have attested time and again, the old roses and species steal the show. By old garden roses I mean Damasks *R. damascena*, French roses *R. gallica*, cabbage roses *R. centifolia*, and *R. alba*. They have an abundance and perfume which the modern roses have never equalled. One reason Crimson Glory is so popular is that it gives a good hint of Damask fragrance.

All these garden roses can be had in the species form and in many fine varieties. Of the cabbage roses there are several outstanding varieties, including *R. centifolia* itself, of course. Petit Orange is a high bush up to 4 or 6 feet, with masses of tiny pin flowers with their hundred petals folded in the neatest possible way, and flooding you with perfume. There is a white one so perfect in both flower and bush that it should have a place either in the rose garden, in the perennial border, or as a specimen bush on the lawn; that is Mme Hardy. I like it both for its perfection and for sentimental historical reasons. Madame Hardy's husband was curator of the Jardin des Plantes at the time the Empress Josephine stirred up the French rosarians to experiment with the rose. He was the first to plant seeds, and helped lay out Malmaison.

Moss roses are like cabbage roses but with furry stems and calyxes; some of them repeat their bloom in the fall. Blanche Moreau is one, white, tinged with pink in the center. The common moss rose is the mossiest, and is a clear rose, and very sweet. The crested moss rose never fails to amuse and please everyone; it isn't a real moss rose, but the buds are fringed and look like bicettes or Napoleon's hat. Variegata di Bologna, a *R. centifolia*, is very large with globular white flowers that are striped with purplish red. It sounds ugly, but it is charming.

Striped roses were to 19th century rosarians what bicolors are to us. They were the *dernier cri*, and a slight variation in stripe was made the occasion for a good *cri*. The first striped rose was a sport, discovered in 1581; many consider it still the finest of them all; it is Rosa Mundi (*R. gallica versicolor*). It is gay and saucy-looking, with white petals painted a brilliant rose, or vice versa; it is often confused with the old Damask York and Lancaster. The latter's popularity is due, I think, to its historical appeal, for the coloring is very modest and the bush droops, while the gay Rosa Mundi stands up erect as all varieties of *R. gallica* do. These have

given us all the depth of color we have in modern roses but they aren't long in perfume. That is why it is good to grow varieties of *R. centifolia*, *R. gallica*, and *R. damascena* together. Some of the good ones are Belle Isis, La Rubanee, and Jeannette. The species *R. damascena* is a fine deep pink with wonderful fragrance. Kazanlik, another Damask, is still obtainable, and is used by the Bulgars for their best attar.

The species *R. alba* is unique, not only in its profusion of clear white single flowers with golden stamens, but also for the quiet, cool beauty of its blue-green foliage. A fine variety is Maiden's Blush, produced at Kew in 1797.

Rosa spinosissima

McFarland photo



Hybrids

There is another old garden rose which must be mentioned, the Bourbon; it was a spontaneous cross between *R. gallica* and the China or Bengal rose. There are two outstanding varieties. One is Souvenir de la Malmaison, creamy flesh with a rosy center, which grows like a hybrid tea and used to be known as Queen of Beauty and Fragrance. Need more be said? The other is a tall bush up to 6 feet; this alone would compensate for the dozens of varieties now lost; it is Coupe d'Hebe, which has the same breath-taking perfection as Frau Karl Druschki. Can you imagine cup-shaped

Rosa multiflora var. cathayensis



4-inch double flowers of soft ice-cream pink festooned along great curving canes Mme. Hardy, Rosa Mundi, Petite Orleanaise, and Coupe d'Hebe never fail to stop even the most casual garden visitor. All of these are as easy to grow as spinach. Our record of never having lost a species or old rose is nothing to brag about; it is common experience. Reliable and lovely they are, and wonderful in the house. They respond well to coddling but they are not at all fussy; and they will bloom if you forget to prune them, forget to fertilize them, and never spray them. Isn't it a mystery that they are so neglected? I have mentioned only a few varieties of the many that are still available. A hundred years ago there were as many varieties as we now have of hybrid teas.

The hybrid teas come from these fine tough but beautiful old ancestors. The reason they are so delicate, so prone to disease, is that they are a combination of the mountain Austrian rose, the China rose, and one which grows in the hot jungles of Burma, as well of these old ones which for centuries have flourished in the temperate zones of Europe and Asia. The hybrid tea hasn't yet had time to adjust either to its own complicated heritage or to the many different climates in which we grow it.

Perhaps someday we shall have in hybrid tea, a sturdy plant, massed with bloom from May to October, scented so that you can smell it a block away, and diseaseproof. But whatever fine things are coming to us, whatever dreams of perfection we have, the discerning gardener will always have some of the species and some of the old garden roses. Remember, blizzards and drought and long rainy spells, they take in their stride. If you browse around the Brooklyn Botanic Garden rose garden this June with notebook in hand, you may find many that appeal to you more than these few have mentioned. If you do, I think you will decide to give a place to some of these simple old beauties.

OUTSTANDING NEW ROSES

Some important Varieties and How to make the Best Use of them

Eugene S. Boerner

ROSES are America's favorite flowers. They have always been so, from the time of the pioneers, when slips were carefully cherished as civilization moved across our broad plains, to our times with the gorgeous hybrid teas, floribundas, and climbers, which are now thriving in practically all sections of our country.

Floribundas

The past decade, with the advent of the floribunda roses, has seen a very decided impetus to interest in roses, and a broader use of them. The floribundas have broken the confines of the formal beds and are found in all parts of the garden. Since they are particularly rugged, and since they follow bloom with bloom, they are fast becoming very general favorites.

As an example, the lovely floribunda Pinocchio, with its glowing pink blooms, may be planted singly or in a little group anywhere, and may be depended on for house flowers throughout the entire summer. It can also be used in the regular rose beds, or as a border for taller perennials; and it is particularly effective if grouped among the shrubs where its bloom can follow such springtime favorites as the forsythia, flowering almond and Cydonias. By grouping floribundas at strategic spots, the long drab shrub areas can be eliminated and the spring color carried throughout the year.

Pinocchio is only one of many very successful floribundas. The very first ones have been superseded by more

vigorous and more colorful varieties. The pink Betty Prior with its single dogwood-like flowers, the red Donald Prior with its richness of tone and its constant bloom, the vigorous deep pink Permanent Wave, and the exquisitely lovely Rochester, which brought with it larger-sized flowers, all have acclimated themselves in all parts of the country. The World's Fair, that brilliant large-flowered red; Smiles, the lovely soft pink; and now the true yellow Goldilocks, are adding more variety each year. In the offing are other extremely lovely shades, a luscious peach, tall whites, a delightful lavender, all on plants that respond luxuriantly to a minimum of required care.

Hybrid Teas

The hybrid tea roses are the real queens in their individual loveliness; and many gardeners are finding that they can grow as beautiful flowers in their own rose beds as they can get from their florists. Part of the joy of gardening is the ability to bring the flowers from the gardens into the homes or carry them to friends.

There are today a great many fine hybrid tea roses which are very easy of culture. The introducers of new roses are now placing decided emphasis on vigor and disease resistance; and as a result the growing of hybrid tea roses is becoming a great deal easier, and the results much more satisfactory.

With such roses as the yellow slender-budded Eclipse, the red vigorous Flambeau, and the pink Katherine T. Marshall, the nucleus of a fine collection may be built. Peace, with its blending of colors; Crimson Glory, the perennial favorite among reds; Neige Parfum, the exquisitely fragrant white; Signora, which

is two-toned; and Mary Margaret McBride, the beautifully shaped soft pink, give us a number of varieties sure to be successful in this eastern area.

If one wants a yellow garden, there are now enough yellow hybrid teas to give a mass effect with a variation of texture. Varieties such as Fantasia, Mandalay, Mme. Marie Curie, McGredy's Yellow, McGredy's Sunset, offer a beautiful assortment of shapes, sizes, and foliage; blend well for a mass; and also give lovely variations for artistic flower arrangements.

Although these newer hybrid teas are easy of culture, the good gardener, who expects the best results, will prepare his beds to a 2-foot depth and will see that there is a good percentage of humus in the soil. Once done, a bed should last for 5 or 6 years before needing renewal. Roses should be in a well-drained spot, and should be watered very thoroughly. The most effective method is to allow the water to run rather slowly until such time as the ground is completely saturated. Light spraying of the tops is ineffectual and is a potential method of spreading disease.

Roses enjoy fertilizer, and a good application in early spring helps produce excellent growth. Smaller applications may be made every 10 days in June and early July, or another larger application may be made just as the first flush of bloom finishes. In the colder areas, care should be exercised that nitrogenous fertilizers are not applied too late in the summer, as this forces soft wood which will freeze in the winter.

Spraying or dusting for insects and diseases is a simple procedure. In early spring it should be more frequent; and later in the season, it may be eased to much longer intervals. Here prevention is the watchword; and with the very

effective new fungicides and insecticides this has been greatly simplified.

If one has a shaded garden, the roses will do in partial shade either morning or afternoon; but if there is a choice, the position having afternoon shade is usually just a little better for growth.

Climbers

Northern areas have long had climbing roses in June; but only recently have everblooming climbers taken an important place in these cold sections. New Dawn the first plant to be patented, has become a great favorite, with its shell pink blooms appearing all summer. The large-flowered Dr. J. H. Nicolas blooms throughout the summer, as does the beautiful climbing Summer Snow. Blaze too has long periods of bloom when well established.

The older Wichuraiana hybrids, like Dorothy Perkins, are fast losing favor except as ground covers; but some of the other hybrid climbing roses, although blooming only once, still have enthusiastic friends. King Midas, Spanish Beauty, Dr. Van Fleet, Silver Moon, Golden Climber, and Paul's Scarlet Climber, are all being used, although the popular demand is increasing for the everblooming types.

Fine effects may be obtained by using on fences groups of everblooming climbers like climbing Summer Snow and Blaze, particularly if floribunda roses are used at the base of the climbers. Summer Snow floribunda and climbing Summer Snow give an effect of white long to be remembered; the same may be done with other colors.

With all these types of easily grown roses available, it is not surprising to see such an ever-increasing number of gardeners turn to the rose.

HARDY ENDURING ROSES

Varieties that Flourish without much Care

John C. Wister

THE tremendous advances made by rose breeders in the past generation or two have given us the modern roses of today, roses of new types, of new colors and of wonderful beauty. I should be the last to say anything against them. There has been a predominating emphasis on the beauty of the flower as grown by the expert gardener. This is quite natural, for the breeders are themselves expert gardeners. Unfortunately in some cases there has not been sufficient attention to the constitution of the plant and to its general behavior under unfavorable circumstances.

This is particularly true in the roses which have come to us from abroad. Breeders in the climates of England, Ireland, France, Spain, etc., can know nothing about how their various seedlings react to our conditions. In the past many of their most beautiful varieties, while not actually tender, have often not endured long under our ordinary garden conditions.

Some American breeders have in more recent years paid special attention to hardiness, or disease resistance. This is most gratifying to the ordinary gardener, and is I believe a most hopeful sign for the future.

I am writing these short notes to call attention to some roses which have been somewhat overlooked in the modern race for larger flowers or more flowers, and new colors. They are varieties that seem to me extremely important, in that anybody can plant them in the garden, and enjoy them without any particular care,

year after year. In other words, they are tough. They survive even in unfavorable locations.

Hybrid Perpetuals

Among these roses are some of the older hybrid perpetuals. General Jacqueminot is red and delightfully fragrant, and in June the bushes are covered with flowers. Like practically all hybrid perpetuals, it then stops blooming; and for more flowers we have to wait for another year.

I might say parenthetically that one can hardly be other than impatient with those gardeners who want all plants to be ever-blooming! I like my daffodils to bloom in the spring, and do not expect them to repeat in mid-summer. In a similar way I like the iris season, and am but little interested in the so-called fall-blooming irises. The same holds for peonies in peony season. The seasons for these flowers come and go, and growers of these plants are quite satisfied that they bloom at only one period. Rose growers have been spoiled by the possibility of having roses all summer. That is, of course, delightful, but it seems unfair to rule out all the varieties which do not have this everblooming quality.

Almost as beautiful and as fragrant as General Jacqueminot, and a good reliable bloomer, is Captain Hayward. I have known plants of it in a garden near Philadelphia which were purchased in the late '90's in the basement of a department store. We who are fond of flowers often deprecate the purchase of plants from city stores rather than direct from the nursery. But in the instance referred to the owner of the garden bought the plants in the late 1890's and planted them in the garden. They grew well for over 12

years. In 1911 the garden was remade and the plants were lifted and reset. They have flourished ever since. They get scant attention. They are in a mixed border of perennials and annuals, with some flowering shrubs which have grown overlarge and shade the smaller plants. Yet year after year they produce great quantities of flowers. About the only attention they get is a rough pruning to cut them down from their summer height,

Double Climbing Rose

Gottsch photo



usually in late autumn, a time when most rose growers do not think pruning is advisable. These plants have stood it, and have bloomed every year for half a century.

Ulrich Brunner, a very fragrant deep crimson, is another old variety in this class. Mrs. John Laing is a pink. Baroness Rothschild a light pink. Oskar Cordel is a spectacular bright carmine and also extremely fragrant. It is listed nowadays as everblooming, but that was never my experience with it. Paul Neyron is a pink with rather a lilac tinge to it. A slightly more modern variety is Gloire de Chedane-Guinoisseau. Its name is unpronounceable and unspellable and if it were important commercially some of our enterprising nurserymen would undoubtedly rechristen it for some movie star! It is a dark velvety crimson and one of the most gorgeous of all roses in color.

Other old kinds that might be mentioned are Captain Christy, a flesh pink and Fisher Holmes, a red scarlet. All these have stood the test of many years and are still offered by some rose specialists, yet they are rather seldom seen in gardens. My experience is that one does not have to worry as to whether they will be there the next year or not, and whether they will get black spot or succumb to other troubles. Naturally they are not immune to pests, but they seem to survive them. In the garden which I have mentioned they have even come through many years of Japanese beetle without spraying. Specialists in rose growing will want newer varieties, of course; but I think, for ordinary gardeners who want pleasure from their flowers without too much effort, that these roses should be strongly recommended.

China Roses

Another group of roses would include the China rose, Hermosa, which is a light pink, usually with several flowers to a stem. The plants that I have known are rather dwarf compared with the hybrid perpetuals. Then there is the variety

which made quite a sensation when it was new, but is apparently not so much grown now, Gruss an Teplitz. I was brought up to consider this a China rose, but Dr. McFarland says the National Rose Society of England classifies it as a hybrid tea. It does not act like a hybrid tea where I have seen it. It is entirely hardy, and endures through the years just like a hybrid perpetual. In the cold winter of 1935 it was killed to the ground in some gardens around Philadelphia, but as far as I know the plants were not killed.

Hybrid Rugosas

A group of exceedingly useful roses, requiring little care, are the hybrid Rugosas. Some of these are newer than the old hybrid perpetuals mentioned above, and some of the newest ones have had a wide popularity. I am thinking at the present time more about some of the old kinds. The species *R. rugosa* itself is useful for planting in shrub borders, and is particularly effective along the sea coast; but some of the hybrids are superior to it as garden plants. The handsomest of these in my opinion is Conrad Ferdinand Meyer, which dates back to 1899; and so it is not a novelty in any sense of the word. It is a tremendous grower, and sometimes reaches the height of 10 feet. It is very thorny. In *Modern Roses* Dr. McFarland notes that it black spots and rusts; but it nevertheless comes through without sprays, dusts, or fussing, and gives great quantities of beautifully formed flowers. I have always been interested in the report that in spite of its hardiness one of its parents or grandparents was Gloire de Dijon.

Less handsome flowers but still nice for the large garden are Mme. Georges Bruant, Nova Zembla, and Sir Thomas Lipton, all tough but loose and straggly growers compared with Conrad Ferdinand Meyer. When visiting the famous Roseraie de l'Hay I was greatly interested in the breeding experiments that had been carried out to try to obtain roses of greater fragrance for use in perfume making. One deliciously fragrant va-

riety was Rose a Parfum de l'Hay, a deep dark double red. Another one almost equally fragrant was Roseraie de l'Hay. There must be 15 or 20 others which have not found their way to any extent into American commerce.

Other Types

Other old roses of quite a different type include Harison's Yellow, which is an old-time favorite, and which persists in old gardens without much care. Then the many varieties of Scotch roses, of which perhaps the most important is *Rosa spinosissima altaica*. It is not large-growing, so that there is room for it in even the small garden.

Any of the roses mentioned can be seen growing happily in the great rose garden of the Brooklyn Botanic Garden, and with them are more modern varieties of these same types.

Roses Over Garden Entrance

Gottschalk



ROSES FOR SEVERE CLIMATES

Varieties Tested in Minnesota

Richard S. Wilcox

IN Minnesota we have had to turn over new sod in rose growing. Our conditions are pretty severe in that we frequently have hot summers and long bitterly cold winters. Notwithstanding this we do have beautiful roses, roses which compare well with any grown in other parts of the United States. This is especially true in the fall, when we have the most intense colors and the most perfect flowers. Roses seem to love the cool days of September and October, and frequently a couple of weeks in November. Furthermore, we are not bothered so much by disease as are rosarians in warmer sections.

Thus our climate has its compensations, and rose growing is on the increase. This is due, to a considerable extent, to the more rugged varieties which have recently come on the market, especially the Brownell subzero hybrid teas and the floribunda types. While these are not truly winter-hardy without covering, they are much tougher than the old hybrid teas. We are wintering them merely by hillling them with about 6 inches of soil, and sometimes throwing some leaves, cow manure, or hay between the hills. The latter practice is not necessary with the subzeroes, although it does protect more of the plant. The floribundas vary in hardiness; some are nearly as tender as the hybrid teas; most of them, however, have more vigor in recovering from the rigors of the winter, but not so much as the subzeroes. An advantage which both these types have over the older hybrid perpetuums is that they do give an abundance of bloom in the fall. The subzeroes give us about 3 times as much

bloom then as the average hybrid tea and, of course, the floribundas are still more profuse, although the quality of the individual flowers is not so good.

Hybrid Teas

Pink Princess has been our favorite among the Brownells. It is entirely resistant to black spot here. While some of the spots may appear late in the fall they are so late that they do no damage. The blossoms are a pleasing soft pink with some copper tones. The plant is so prolific that it overblossoms unless some of the side buds are taken off. We usually take some off, especially in the hot mid-summer. Then the fall flowers are gorgeous, 4 to 5 inches in diameter, a intense deep pink, blooming right at temperatures that reach as low at night as 20° above zero.

Next to Pink Princess we rate Lil Pons. Because it has been unusually satisfactory in the last 2 years, it is placed first by some. It might be entitled to first place if it were not for the fact that it is susceptible to black spot, and that if planted in heavy soil it is inclined to ball in an excessively humid fall. The blossoms are truly of exhibition quality, many of them born singly on a stem, but still a great mass on a plant. A bed in full bloom with the soft white (it is nearer white than yellow to us) against the rich deep green foliage, is a sight that stops everyone. The Lyndale Rose Gardens at Minneapolis contain one of these beds, and visitors talk more about it than any other variety. If the susceptibility to black spot could be bred out of it, this would be a nearly perfect rose for us.

Break o' Day, one of Brownell's firsts is another variety which ranks high.

s an unusual color combination, soft pink, salmon, and orange; some think the color too light but most people adore it. It attracts about as much attention as any rose in my garden. While it is not quite so winter-resistant as Lily Pons and Pink Princess, it is not difficult. Its climbing sport is also proving excellent.

We are looking forward to the reds which the Brownells are about to introduce, most of them crosses between Crimson Glory and Pink Princess. Some of these we have tested, and they show much promise. Brownell's Red Robin has striking scarlet red color, but the quality of the bloom is uneven; the plant is extra-hardy.

Among yellows, King Boreas, although its blossom is small for a hybrid tea, is prolific, hardy, disease-resistant, easy to grow for any color and especially so for yellow. Some like it much; others think the blossom is too full and too small; it makes a striking garden show. V for Victory is larger and has a more showy bloom, but does not have so many blossoms as Boreas; neither is the plant so foolproof; it is, nevertheless, among our best yellows. Louise Wilbur, a variety Brownell has named but never introduced, strikes us as excellent. It is a rich golden yellow, not very double, and the blossom does not last long; but there are many flowers on a spreading vigorous plant; it has foliage as beautiful as any of the climbers, but is subject in small degree to black spot.

Tompkins Red has a rather small deep velvety red blossom on a tall extremely vigorous plant, at times nearly a pillar. It represents blood of Nigrette, the black rose, introduced into the subzero type. M. B., beautiful golden scarlet but soft, is (I believe, and many others agree) among the most strikingly beautiful of roses. The original variety showed black spot badly, and did not bloom freely after the first heavy bloom. A new one under the same name is one of the most prolific bloomers, on an unusually vigorous plant, which is nearly resistant to black spot.

I wouldn't be without it. Laughter is another variety of Brownell's, not so well known as the others. It is a semidouble, of scarlet, salmon, and gold colors, very pleasing. It takes black spot badly; but Brownell has a selection of it, which I haven't yet tried, but which he reports to be resistant to this worst of pests.

There is wide variation among the roses which we now classify as regular hybrid teas. Crimson Glory is a vigorous spreading plant full of deep crimson perfectly formed bloom, quite winter-hardy, and rugged enough to make a quick recovery from winter rigors. It is a must. Mirandy is good, but unlike some who have tested it, we can't rate it better than Crimson Glory. Charlotte Armstrong, vigorous and free, is ranking right at the top, and we are much interested in its progeny, which H. C. Swim of Armstrong's Nurseries of California, will soon have ready to introduce. Clarotte is out of Crimson Glory and Soeur Therese, the latter being one of our best yellows. The new Peace promises to be more rugged and superior; its dark green large leaves, tall plant,

Rosa Rouleffi

McFarland photo



long stems, and large blossoms of hybrid perpetual form, make it appear to be a winner. Ernie Pyle, just introduced, is another more vigorous rose of the type which we need here.

Everblooming Climbers and Floribundas

We must not forget the everblooming climbers. New Dawn ranks first here, while Dream Girl, Orange Everglow, and Birdie Blye are good and easy to winter. Blaze, brilliant in summer, gives some bloom in the fall.

Among the floribundas, the new Pink Bountiful has done strikingly well so far. Pinocchio is a beautiful little salmon pink that is also good. World's Fair, Holstein, Donald Prior, and the less known Adolf Grille, with Kirsten and Karen Poulsen, are all excellent reds. Adolf Grille has individual blossoms of better form than some hybrid teas, and still it has a strong plant. Among pinks, Betty Prior, Else Poulsen, Lafayette, are good; while among whites, Summer Snow, Dagmar Spath, and the little-known Baby Alberic, are excellent. The latter has perfectly formed miniature hybrid tea blooms, and many, many of them.

Other floribundas, difficult to buy because most nurseries do not list them, but still extra-good are: Eutin, vigorous, free-blooming, red, out of the semi-climber Skyrocket (I have it on its own roots; this bears out the growing impression that some of the more vigorous roses can well be propagated from cuttings and may be better that way in the cold climates); Hythe Cluster, much like Else Poulsen, but with larger clusters; Hildegarde, formerly Hofgartner Kalb, with large pink blossoms on an easy-to-grow plant; Mary Guthrie, tall and spreading, with deep pink single flowers and resistant foliage; Nearly Wild, one of Brownell's, which might be classed as a subzero single. This last is the hardiest, the most persistent and prolific bloomer, and the easiest to grow of all everbloom-

ing roses. It is a wonderful low shrub for the border, but the plants should be in groups of at least 6 for mass effects; then you will never be without bloom all summer and fall. It stands abuse almost without limit. The blossoms last a long time in a low vase in the house; the color is deep pink, especially intense and beautiful in the fall. If one has really developed his ideas of beauty far enough so that he can appreciate the simple air of the lovely single rose, this is the rose

New Culture Aids

Through more or less scientific experimentation we have found some cultural aids to the raising of roses here. Dr. L. E. Longley, chief of the division of ornamental floriculture at the University of Minnesota, famous for his new hard chrysanthemum creations, has been leader in this work. One important discovery is that budded roses should always be planted $2\frac{1}{2}$ to 3 inches deep. This gives automatic protection which makes wintering much easier. Apparently they grow just as well when planted deep as when planted shallow according to the old practice. There has been much controversy about this, but I think now it is practically universally admitted that deep planting is the right practice in cold climates. Even at Portland, Oregon, deep planting is recommended by Fred Edmunds. After using many different methods of covering, we have decided that soil hilled around the plant (or placed over the stems in the case of climbers) is the best.

Future

We want still hardier varieties. Of course, we have Rugosa; but Grootendorst is almost the only true everbloomer of that type; although Schneezwerg, the dainty white, is nearly everblooming, and is a beautiful shrub. We hope to have the University of Minnesota do some rose breeding; it has met with much success in creating hardier winter apples, pear

apricots, grapes, blue plums, and even peaches. The Canadian agricultural colleges are doing a lot, and now that the war is over, will probably do more. F. L. Skinner of Dropmore, Manitoba, is doing a considerable amount, and has produced George Will, a step ahead in Rugosa large-flowered hybrids. E. S. Boerner, of Jackson & Perkins, is giving us new roses of outstanding vigor. He is injecting some of the blood of *Rosa nutkana*, the Alaskan wild rose, into the hybrid tea strains.

The future is promising, therefore, for roses here in the Northwest; but even

now there are many excellent rose gardens throughout the State. Dr. Joseph H. Vogel, of New Ulm, has one of the most beautiful gardens to be found anywhere, loaded with bloom most of the summer. Rose shows are becoming common. Other flowers come and go in popularity, but the rose seems to remain always at the top. Maybe if it becomes too easy to grow it will not be so popular, but we have a long way to go before there is that danger. Even now one is well repaid for any extra pains, for even in Minnesota we have more than 5 months of bloom.

HARDY AND HEALTHY ROSES

When is a Rose absolutely Hardy and free from Disease?

Walter and Josephine Brownell

HARDY and free from disease! All those who have grown summer-blooming roses for a season or two will turn their thoughts to hardiness and disease resistance. It sometimes seems that the most beautiful blooms come on the most tender plants. Yet if you ever have a garden, sooner or later you will want to enjoy the glorious beauty of ever-blooming roses.

Your Editor has chosen us to tell of one such gardening venture that was started long ago. In these days you will not begin rose growing in the same blissful ignorance with which we planted our first hybrid tea roses decades ago in Rhode Island. The matter of plant sturdiness and fungus infection never entered our minds. With plenty of room in the country for a rose bed, and a catalog illustrated with gorgeous rose blooms, we planned just what we wanted, a bed of roses to bloom all summer long. How terrible it would be if we were born into

this world with the knowledge and experience of advanced years! Praise be to the happiness that goes with the inexperience of youth, and the joys of unhampered anticipation. Such was life with us and our roses during the early bloomtime in that gardening venture.

Early Failures

Growing hybrid tea roses out of doors was then something fairly new. Friends came to share the glory of early summer roses. We almost had the feeling of having discovered something. But that feeling soon passed with the midsummer withering of foliage, and was completely crushed by total plant mortality during the first winter's cold. Should we give up rose growing, or should we seek other varieties that would perhaps prove to be absolutely hardy and free from disease?

Other catalogs, not so conscientious as those of to-day, listed rose blooms of spectacular beauty, and described the plants as hardy and disease resistant. These, after planting and trial, were quite similarly found wanting. How often early experiences seem to us purely personal; later we find them quite universal.

Problems and Plans

Lack of hardiness, and susceptibility to fungus infection at first glance appeared to be simple matters. Could we not find plants in nature, even of roses, so fortified against such weaknesses that they would survive? Then, too, genetics, a new subject of growing importance, would define for us Nature's laws of in-

heritance. Such thoughts seemed undoubtedly the answer. With a few strokes of the pollen brush, perhaps all these limitations of garden forms of roses could be brushed aside. The question never arose in our minds, if it were so easy, why it had not been done.

With all this ignorance for a background, together with dead hybrid teas in the garden for experience, and the

Roses in a Cottage Garden

Gottsch photo



thought of perfect, easy-to-grow roses, the Brownells started, soon after the turn of the century, to free garden roses from all weaknesses and disease. If you wish to hold our friendship please do not ask if we have succeeded in doing that; but many gardeners who love the Queen of Flowers, who enjoy her in the garden and on the table, might be interested in a very cheerful outlook for garden rose sturdiness.

Whenever we have started sounding the depths of genetics to be applied to rose breeding, even under the kindly co-operation of leading geneticists, our heads have promptly gone dizzy; and so none need have fear of our leading him into that.

Hardiness

It is easy to confess that even the problem is very different from what it first seemed to be. Let us for example consider hardiness. One would naturally think of hardiness as a condition that would insure the life of a plant through the winter. Each variety of rose is so constituted that it can resist injury from wind, cold, and sleet only to a certain degree. That degree is *very definite* and *constant*. The wood of certain varieties is destroyed by zero weather, another variety can withstand 10° below. One variety will usually be killed root and all at 5° below zero; another can usually survive below earth-protecting level at 35° below, and form a normal bush larger and larger year after year.

Following such plant performance as affected by winter environment, it is easy to appreciate winter conditions which no rose plant could possibly survive. All mountain climbers who have passed above the timber line into the dwarf tree belt and beyond, are well aware of earthly winter conditions through which no plant can live. Thus the word "absolutely" disappears from our consideration of hardiness. That part of the problem becomes in reality: "When is a rose hardy

enough for our reasonable satisfaction?" The answer depends upon the further question: "How severe is your winter going to be?" Since scientific gardening holds the "Farmers Almanac" in distrust, with some uncertainty about the weather-man, and with not too much respect for our individual prophecy, the point must be determined by temperature and other environmental averages, with due regard to seasonal low temperatures.

It has been said that in many locations 50% of certain tender everblooming roses fail each year. This is far too large an average for well-selected carefully-cultured hybrid teas. It is true however that their mortality during the past has been so great as to be discouraging to many who have planted them, and to cause thousands to give them up.

The annual mortality of hardy climbing roses might be estimated to be about 1 or 2 in 100. Most of these are hybrids of the species *Rosa Wichuraiana*. This species was chosen for the work of hybridization in our garden. Its degree of resistance to cold is sufficient to satisfy gardeners as to longevity, and it is resistant to black spot. It also has a pleasing history as parent to many popular sturdy climbers. Could this sturdiness, by more breeding, be carried on to hybrid tea descendants?

There was a common conception among rose hybridizers in the early genetic period, that hybrid teas developed from hardy climbers would inherit the tender qualities of the hybrid tea. That has been proved not to be universal. Some of such hybrid tea descendants will inherit the hardiness from hardy climbers; but that is not all that they will inherit. After many generations of crosses, following proper selection and recombining of characters, hybrid teas developed from climbers will produce flowers as large, fragrant, and beautiful as any ever seen from the green house or from the garden; all in combination with that quality of winter-hardiness desired.

Black Spot Resistance

You would be pleased to think that in a few more years you would be able to have a rose bed that needed no replacements and that was free from disease. By the term disease in connection with roses, black spot is usually meant. True, there are other diseases, and infestations of insects, but they are infrequent and of minor importance compared with the destructive black spot. Black spot is universal, and nearly all garden roses are susceptible to it. It was black spot that caused the foliage in our first garden to turn yellow and drop off. If many of your roses have lost their foliage by mid-summer, it is doubtless because of black spot. Black spot spores seem to be everywhere; they light on the leaves; in sufficient dampness they adhere and produce the spots. It is not news to most gardeners that black spot can be controlled to a certain extent by dusting or spraying thoroughly each week with some such dust as sulphur or with one of various chemicals. There has been much research devoted to improving this control. Proper application of appropriate sprays or dusts still is necessary for the successful growing of roses. Without this, discouragement and disappointment are inevitable.

Through the courtesy of

Bobblink & Atkins, East Rutherford, New Jersey; Jackson & Perkins Company, Newark, New York, and The Conard-Pyle Company, West Grove, Pennsylvania, PLANTS & GARDENS is enabled to present the color illustrations of well-known roses.

Rosa Wichuraiana is free from black spot injury during the growing season. This character can be bred into thousands of hybrid teas, making them immune during their seasonal growth. We are now just beginning to leave the horse-and-buggy days of rose growing. Over the coming years rose hybridizers may breed untold varieties which, without sprays, can hold their foliage, free from black spot, all summer long until frost. This must be done by breeding through an ancestor resistant to black spot. The sun must shine upon the leaves, and the leaves must be in good condition, to produce healthy growth. The leaves must be free from black spot to obtain continuous bloom. Black spot will not long curtail midsummer flowers. It is on the way out. Hundreds of varieties of the most gorgeous roses will be available to you during the coming years to grow unhampered, as sturdy and free as the shrubs in the border.

Value of a Hobby

The Brownells have spent many years with roses, first as a hobby, later as a serious research. Most important of all we have learned what we now wish to share with everyone: the joy of an interest. While you are yet young, start a hobby. There is none more fitting than a horticultural one. It need not be roses. Find some favorite flower that has an appeal to you, plant it, study it carefully. Be informed of the progress made in its culture and development. Do not wait until you are older. It may then be difficult to build up a new interest quickly when it is needed. Much happiness will come in later years to those who have developed a hobby and who ride it hard.

*Silver
Moon*



*Rouge
Mallerin*





California



*President
Hoover*

Countess Vandal





Mandalay

ROSE TESTING

With particular Reference to
Winter-hardiness

C. Eugene Pfister

As the Chief Rosarian of the Men's Garden Clubs of America it has been my pleasant duty to arrange for testing and tabulating the results of rose performance in the gardens of 40 club rosarians, located in all sections of the country. That these men enjoy their work with roses is shown by the fact that their gardens average 250 or more plants each. Their reports show the differences in climatic conditions, growing habits, development, and profusion of bloom. Roses which will perform magnificently in one place may be average in another locale, and vice versa. Club rosarians render a service to their fellow members and to their communities, in helping beginners get the proper start, and in advising the more advanced gardeners regarding cultural practices, growing for exhibition, and the characteristics of the latest novelties.

To me the rose is the most appealing and interesting of all flowers; and growing roses has been my own personal hobby for 15 years. The one outstanding characteristic which seems to appeal particularly to men, I think, is the recurrent blooming habit of the modern rose.

Roses have many uses in the home garden, for they have varieties and types which fill so many needs that they can literally be planted anywhere in the landscape. They serve as shrub borders, they cover walls and sides of buildings, they border walks and driveways. For formal effects they are hard to surpass, as is evidenced by the many rose plantings in public parks, on large estates, and in

myriads of small gardens. There are roses ranging from large sturdy shrubs to tiny miniatures—with many variations between. And there are hundreds of varieties available which bloom from spring until frost. The only restraining factors are too much shade and wet conditions of soil.

Climatically, practically all of the newest varieties, and many of the older ones, have proved that they are compatible with the cold middle west and fare almost as well there as they do in more favored sections. Our garden is in a section where the temperature can drop to 20° below zero or lower. We are often concerned during the alternate thawings and freezings of February and March, and can hardly wait until April to see just what damage has been caused. It is seldom as bad as we anticipate. However, we have learned that a rose plant which goes into the winter in a weakened condition generally does not survive.

Species Types and Hybrid Perpetuals

Species types as represented by *Rosa Hugonis*, *R. xanthina*, Harison's Yellow, Persian Yellow, the sweetbriers and Ruggosas, the Scotch and moss roses, the cabbage rose *R. centifolia*, the French rose *R. gallica*, and the native prairie rose *R. setigera*, will produce handsomely. The hybrid perpetuals may winterkill almost to the top of the hills of earth that are used for winter protection, yet grow into strong sturdy bushes carrying a goodly number of flowers during the year.

Climbers

The climbers are a problem, as the only safe method of preserving the bloom-

ing canes from season to season is to remove them from their supports and cover them with earth; otherwise these canes are killed back to the ground, and must start anew each spring. Many of the special cold-country climbers do not keep their wood through the cold winters anymore than the regular rambler and large-flowered varieties of older vintage. After a winter with deep snow over a long period they seem to be much better than they are after more open winters.

Floribundas and Hybrid Teas

Floribundas (hybrid polyanthas) are increasing tremendously in popularity

because of their ability to come through the worst winters and give myriads of flowers on the plants year after year with infinitesimal loss. The subzero hybrid teas and the dooryard type of roses are also creating wide interest for the same reason. The hybrid teas as a group will winter well with proper hillling up. However there are varieties that are not constitutionally suited to our climate; these are eliminated or eliminate themselves. Unquestionably the gardeners of America are receiving new varieties that have improved hardiness. May this trend continue!

OLD ROSES

Three Climbers brought from China a Century ago

Ethelyn E. Keays

JUST 100 years ago Robert Fortune, botanist and plant hunter, was returning from his first collecting mission to China. Two years previously, at the age of 30, he had been sent on this mission by the Royal Horticultural Society to collect for the Botanic Garden at Chiswick with which he was then connected.

A few years before Fortune went out, the Opium War had put an end to the activities of the plant hunters. The final treaty between Great Britain and China granted to Britain the island of Hong Kong and opened certain coastal cities for trade. However, the vast interior of alluring China was tightly barred, forbidden territory. Field for search was limited to the nurseries, private gardens of mandarins and rich merchants, and temple grounds of these hong ports. Within that field only cultivated plants, established garden varieties and species, were collectible. Fortune went as far as he could.

Canton, where the British had gained foothold for trade by might of sea power and had held it for more than a century and a half, had a famous old nursery garden for the sale of plants. Every British plant man headed to Canton first. Fortune says, of himself, "I lost no time in visiting the celebrated Fah-te garden near Canton, 'the flowery land,' as the name implies."

Fortune went to China 4 times; he made his last journey there when 49 years old. By the time he had completed his work, it is said that there was not a garden plant left for the next man, Fah-te or the gardens into which he penetrated. About his travels and hazardous experiences, he wrote 4 books which are remarkably interesting to this day, for they cover the period of a great era.

The species and varieties of tree flowering shrubs, and garden plants the vigorous, insatiable plant hunter contributed to English gardens numbered next to 200, perhaps more, the greater number new to botanists. Because of his fine sense of plant value and his technical skill in transporting specimens, Fortune's introductions survived better than man-

and eventually contributed much to plant development.

Among the early introductions were 3 climbing roses: Fortune's Double Yellow (1845), *Rosa Fortuncana* (1842-1845), and *Rosa anemoneflora* (1844). With these 3 roses, now considered old roses, we have to do. That they were grown in this country is quite certain. This was a time when we were gardening eagerly, north and south, importing plants from the continent and England. That they survive, may be found, may be restored, is quite certain, too.

Fortune's Double Yellow

A rose we have known for years but have never grown is Fortune's Double Yellow (*R. chinensis* var. *pseudindica* Willmott; *R. odorata* var. *pseudindica* Rehder). Beauty of Glazewood, Gold of Ophir; it is of striking beauty, if and when it is grown and tended as it demands. Let Robert Fortune speak first about his lovely rose: "The rose was discovered in the garden of a rich mandarin at Ning-po. It completely covered an old wall in the garden and was in full bloom at the time of my visit; masses of glowing yellowish and salmon-colored flowers hung down in great profusion, and produced a most striking effect." He adds elsewhere: "I have no doubt from what I afterwards learned that this rose is from the more northern districts of the Chinese Empire and will prove perfectly hardy in England."

Fortune's Double Yellow is a climber throwing long shoots, carrying prickles much hooked, 5 to 7 leaflets with hooked prickles on the petiole. The flowers, 3 to 4 inches in diameter, forming a corymb, are double with loose petals like the early teas, sweetly fragrant; the petals salmon-yellow tinged with crimson lake on the outside. It is June blooming.

We find this rose in the South and hear about it in favorable places in the far West. Possibly it could be more widely grown, certainly north of Georgia. Miss

Kingsley, who grew it in her garden in England, wrote: "That singularly beautiful rose Fortune's Yellow or Beauty of Glazewood (Fortune 1845) which is classed among the Noisettes although it has nothing but its beauty in common with them for it is not perpetual and its foliage is quite different—requires a very dry warm situation, when if *it is never pruned* it will flower abundantly." A point to be observed is that the flowers are borne on the small twigs growing from the laterals of the second year. This explains the caution about pruning and the wreath-like profusion of bloom.

Fortune's White Climber

Profusion of bloom is characteristic of Fortune's white climber, *Rosa Fortuncana*, believed to be a cross of *Rosa laccigata*, our Cherokee rose, with some form of the Banksian group. Fortune found this rose in both Ning-po and Shanghai. In the south of France where it has been grown very happily, it goes by the name Banks de Chine. *Rosa Fortuncana* could easily be mistaken for a double Cherokee. I came unsafely near to making that mistake on a visit to a garden opened for benefit of some charity. An enthusiastic, too trustful lady led me to a rose on a trellis heavily laden with double white flowers, and put her question, "Now, what old rose is this?" At first glance it seemed like what a double Cherokee would be. We examined a plant of Anemone, the single pink hybrid of Cherokee. We compared the two, but as both are hybrids, this proved nothing; yet the white rose may have been *Rosa Fortuncana*.

Rosa Fortuncana throws long slender climbing shoots with small prickles, scattered, uniform, hooked, as in the Banksia. The handsome, shining leaflets, green, firm, persistent, and able to take quite a frost bite, are like those of *Rosa laccigata*.

Miss Kingsley grew this rose in her garden in Herts. She says of it: "It is

much hardier than the Yellow and White Banksians. The flowers, large, full, white and sweet-scented, grow singly, not in clusters, and are borne like those of the Yellow and White Banksians, on the sub-laterals, i.e. the little flowering stems on the laterals of last year." This indicates that her advice about pruning Fortune's Double Yellow is to be underscored for *R. Fortuncana*.

We cannot help feeling that *Rosa Fortuncana*, so vigorous, so free in flowering must survive in our rose-loving South, only waiting to be reported and restored to its honorable place as a Robert Fortune rose.

Fortune's *Rosa anemoneflora*

Fortune's *R. anemoneflora* (now called *R. triphylla*) bears the date of 1844. It was found in Shanghai. It is a puzzling combination, perhaps Banksia and *Rosa moschata*. Yet its hardiness would suggest something more. Better let that subject rest.

In Maryland we twice discovered a rose, bushy, arching and climbing to which we gave the descriptive name, Pink Musk Cluster. In all its details our rose checks with the color plate in "The Genus Rosa," even to the pinkish centers. However, in the text blooms are described as white. Mr. Bunyard in "Old Garden

Roses" says "white." In Bean's "Tree and Shrubs" we find "blush-white"; in Bailey we find "white or slightly pinkish."

Ten years ago we brought a plant of our rose to Long Island and have watched it through the seasons. It has always been pale pink. In years when color of all roses has seemed higher, the bloom have been more than "slightly pinkish." Here it has endured our hard and ease winters, and necessary neglect through the war years, varying only in having more dieback. Certainly it is steadfast in its growth and flowering, under ordinary rose culture. Here, once more, pruning should be confined to dead stalks, no flowering laterals.

Is our rose a variant? Was the plant called Fortune's *R. anemoneflora*, growing at Warley, from which the plate was made, a variant? Is our rose Fortune's *R. anemoneflora*, from Shanghai? Is it not?

These 3 climbing roses from the gardens of coastal China, interesting and beautiful as each is in its own way, may seem but pretty incidentals in the industrious successful work of Robert Fortune; but, when we read of the "surprise and delight" he felt when he discovered his Double Yellow, we have a right to feel that he, like every honest plant hunter, was happy when he could make a real contribution to a garden.

HOW TO GROW ROSES OF EXHIBITION QUALITY

The Value of careful Selection and Culture

John B. Carson

IF roses are to be grown, they should be grown as well as possible. Too often when roses are planted, little attention is given them, and disappointment follows. On the other hand, if a reasonable amount

of thought is given to their proper selection and care, a great deal of pleasure and enthusiasm will surely follow and make the necessary effort well worth while.

Location and Preparation of Rose Bed

First of all, the rose garden must be properly located. A location on ground

sloping to the south with a protecting hill to the north is ideal. Other means may be used to accomplish these ends, such as planting evergreens to the north, or securing proper drainage by means of gravel in deeper beds.

The rose beds must be well dug, 18 inches to 2 feet deep; well fertilized, with plenty of manure and fertilizer incorporated with the soil; properly located, with one half to three fourths of a day of sunshine; and well drained, with sufficient aeration.

Selection of Varieties and Quality

Having located the rose beds and having given them correct preparation, the proper selection of both the varieties and the quality of the plants is important. Too often the propaganda in rose catalogues sells varieties that are not suitable or adaptable, and disappointment follows. Some varieties will do much better than others. Experimentation with different ones is interesting, but is also expensive.

No matter what varieties are selected, the individual plants must be carefully examined. Here a lot of disappointment is ahead for many amateur rose growers. Too often poorly grown or poorly handled plants are sold; this is done either by mail or over the counter. I have repeatedly received, or seen for sale, diseased plants, dried-out plants, and plants with insufficient root systems, that were foredoomed to failure or that would be a menace if introduced into a healthy garden. Some rose nurseries permit a personal selection of rose plants; these nurseries deserve patronage. The men in charge of them take pride in their stock and do not want their reputation ruined by the sale of plants which will never give satisfaction. Insist on healthy, strong, vigorous plants with good root systems, and discard or return all plants that do not meet rigid requirements. Poor plants will grow after a fashion, and will bloom, also after a fashion; but who wants to spend money, time, and effort on poor plant material?

The proper selection of varieties is im-

portant. More pleasure is derived from growing beautiful roses than from making excuses for miserable blooms that could have been much better. The personal whims and wishes of the individual grower will govern his or her selection of varieties; and this should be so, for much pleasure can be had by pursuing different ideas with different kinds of roses.

The following hybrid teas are offered as a selection of varieties which have given pleasure and satisfaction in the Philadelphia district:

White—	McGredy's Ivory Caledonia
Red—	Crimson Glory Poinsettia W. E. Chaplin Texas Centennial
Pink—	Mme. Cochet-Cochet Pink Dawn Pres. Macia Sterling
Multicolored—	Comtesse Vandal Duquesa de Penaranda Mme. Joseph Perraud Mme. Henri Guillot
Yellow—	Soeur Therese Golden Dawn

If a start is to be made with 2 dozen roses, it is better to plant 4 plants each of 6 varieties, rather than 1 plant each of 24 varieties. For instance, 4 plants each of Crimson Glory, Comtesse Vandal, McGredy's Ivory, Golden Dawn, Mme. Cochet-Cochet, and Mme. Joseph Perraud should arouse a desire in any neophyte to experiment further. The polyantha (or floribunda) roses should be given a trial by all rose growers. They are coming more and more into a deserved popularity. Betty Prior, Rosenfe, Else Poulsen, and Pinocchio are all good pinks; Red Ripples and Donald Prior are good reds, and Dagmar Spath is a good white.

The climbers are almost unlimited in variety. Many can be planted to good

advantage alone as shrubs; or they can be planted on banks and allowed to cascade or billow up and down. The climber Flash, planted as a shrub with plenty of room, is very striking when in full bloom.

Planting

Next, planting must be done in the proper way and at the proper time. Whether this is done in the spring or fall does not seem to make much difference. One year fall planting gives better results, but the following year may show better results from spring planting; the important thing is to plant good roses, and if this is done in both spring and fall, you may be able to decide which is better for you. Hybrid teas do better if planted about 18 inches apart; other roses require more room in which to flourish.

Care

Proper care must be taken of roses, as of anything else. They are far from being "too difficult"; and their necessary care leads to more knowledge of them, and more interest in them. Like all living things, roses must have food, water, fresh air, and sunshine, and also must be protected from their enemies. If attention is given to these needs, success will surely follow.

Manure does well when dug into the beds in early spring, followed a couple of weeks later by a liberal application of a complete fertilizer (such as 5-10-5). Fertilizer should be used again as needed, but not too late in the summer, because early frosts may kill young growth.

Water must be freely supplied; and if there is not sufficient rain, then it must be given artificially; when this is done, the beds should be soaked, but not the foliage of the plants.

The soil should be kept in good tilth; this is accomplished by cultivation as frequently as may be necessary, or by means of a mulch put on over well cultivated soil.

Roses must be protected from their enemies. Copper and sulphur compounds

are the usual fungicides. Fermate is a new fungicide of promise. Arsenate of lead is used against the leaf-eating insects, but D.D.T. may simplify this problem. Nicotine sulphate takes care of the sucking insects. These preparations can be easily prepared in a 3-in-1 spray, or dusting powder may be used. The end to be attained is to keep plenty of healthy foliage growing. The leaves manufacture the food that the plants use, and good blooms will not be obtained unless there is adequate foliage on the plant.

Hybrid teas require some winter protection in most parts of the United States. The simplest way of doing this is to put several shovelfuls of soil on each plant after several frosts have stopped growth in the late fall or early winter. Further protection may be given if necessary by putting hay on top of the hilled-up plants.

Spring pruning is usually governed by the canes having been killed during the winter down to the parts of the plant that have been covered with the protecting hill of soil. When these hills are removed in the spring, all dead or weak growth is pruned away. In the fall, before hilling up, the upper portions of the plants may be cut away to facilitate adding the soil.

Competition and Association

Whether you grow many roses or only a dozen or so, enter them in rose shows when possible. Competition will teach you more about growing flowers, in a short space of time, than anything else. It is a good form of recreation and will lead to new and pleasant associations. Exhibiting roses is a fascinating game in itself, in which attention to details, at just the right time, often means the difference between success and failure.

By all means grow roses; but also try to grow them as well as possible, so that they will be of exhibition quality and worthy of competition. All rose growers should belong to the American Rose Society. Gardening is a wonderful recreation, and growing good roses will give a great deal of pleasure to all who try it.

MAINTENANCE OF THE ROSE GARDEN

Minimum Care for Everblooming Roses

Gertrude M. Smith

HOW far the rose plants that are bought each year would go if laid end to end, I do not know. Surely they would stretch for many a mile. And the words written about roses each year, also laid end to end, would probably stretch as far. What is written here does not cover the fine points of rose growing. It is for the average person who is not an expert and never will be, and who perhaps leaves the garden to the tender care of the man-by-the-day, but who feels that no garden is complete without a few roses.

Known to all, and loved by all, the rose can grace the garden or can be allowed to become shabby. Why anyone should wish to keep miserable roses year after year is a puzzle. It must be some belief in magic, some hope that suddenly the bush that has been barely maintaining life for years will suddenly burst into radiant bloom.

It is amazing how roses that have been neglected, but have a fairly good environment, will respond to a little regular attention. Usually the weaker ones have died out; the ones that survive have strong enough constitutions to make the most of the improved conditions, and the result is a crop of fall roses that would not materialize under neglect. With a new planting of roses, get into the habit of remembering their needs from the beginning; it is well worth while.

There is great variation in the amount of care needed to keep different types of roses in good condition. Many of the sturdier roses, such as the prickly and delightful old Harison's Yellow, live on for generations, giving bloom in spite of neg-

lect. But the roses that are bought in great numbers year after year, the ones that are named after celebrities, and introduced with a fanfare of colored pictures and glowing words, the so-called everblooming roses, must be catered to, or they will not thrive.

Basic Requirements

The soil requirements of the rose are those of many of our most prized garden plants. They despise wet feet; they need a fertile soil, well aerated, free from the fine feeding roots of trees; also adequate moisture, and several hours of good sunlight a day.

In addition to these basic requirements, everblooming roses must have some sort of spraying or dusting schedule, which must be kept to, if they are to thrive. Hybrid teas suffer most quickly from neglect. Some of the new polyanthas and floribundas seem sturdier, but they too are susceptible to disease and insect attack. Climbers and ramblers and the dependable hybrid perpetuals may be very badly chewed, or disfigured by disease, if they are not watched and dusted when they need it, though they do not need the continual protection required by the others.

Pruning

Let us consider the care necessary for the well-being of everblooming roses through the year, assuming that the basic requirements have been met in the location of the bed and the soil preparation. In the spring, when the chance of really cold weather is over, the winter covering is taken off, and the bushes are pruned. The shears or knife should be sharp. Some people leave the bushes pruned high, others cut severely. The type of rose and the effects of the winter will also

influence the amount of pruning to be done. In any case, all dead wood should be removed. The wood that is green and smooth will make good new growth and can be left fairly long. Sometimes a branch looks green, but is shrivelled; this should be cut back to smooth wood with a good bud. Old, dark, woody branches should be shortened considerably as the sap does not seem to flow through them strongly enough to produce good new wood; if they are cut back severely, they should send out strong new shoots. Sometimes in the middle of a fine green cane there is an area where the bark looks unhealthy, perhaps dry and wrinkled; this is probably a canker, and the cane should be cut to a bud below it. It is best to cut to a bud facing out from the bush; this keeps the plant open. Inside buds will produce shoots that crisscross in the middle of the bush.

In pruning a bed of mixed varieties it should be remembered that not all kinds grow alike. Some roses, such as the Radiance roses and Betty Uprichard, are naturally tall, and their vigorous growth should not be sacrificed to make them uniform with smaller kinds. After this first pruning, the plants should be looked over at intervals during the growing season to see if any further cutting is needed. Dead wood should be cut off. If the foliage on a branch wilts, investigation will usually show up a canker that was not noticed before; the branch should be cut to healthy wood. Rose prunings, even small ones, should be gathered up and burned as a sanitary measure.

Fertilizers

If the roses were manured in the fall, usually most of the manure can be worked into the soil when the plants are uncovered. Wood ashes, from the winter's hearth fires, can be sprinkled over the bed, about a handful to each plant (also a handful of superphosphate or bone meal per plant) and raked into the top layer of soil. With the nitrogen from the manure,

these will supply the 3 elements most needed for plant growth. Manure will also keep up the humus supply in the soil; if it cannot be obtained, peat moss or compost, put on as a summer mulch, can be used instead. Then a complete fertilizer such as 5-10-5 or 5-8-7 can be used, at the rate of a handful to a plant. Care should be taken to spread it evenly, and mix it thoroughly with the soil, but not so deeply that it will come in contact with the roots.

Summer fertilizing is best omitted unless it is done by someone with a real knowledge of when and how to do it. Especially when it is done after midsummer, it is apt to force the plant into new growth that does not ripen properly before winter, and that is easily killed by the cold.

Insect and Disease Control

Now for the all-important matter of controlling the insects and diseases that attack the rose. Healthy foliage is essential for the production of flowers; each and every leaf is precious for the food it manufactures. A bush with leaves chewed, sap being sucked out, or disease causing the leaves to fall off by midsummer, cannot thrive, much less bloom. Spraying or dusting is a must, month after month, year after year. Spraying and dusting are not such difficult jobs as some gardeners imagine. Dusting is easier and quicker than spraying, and seems most practical when there is a small number of roses to be cared for. The duster reaches the underside—the vital side—of the leaf easily. It is through the underside of the leaf that the deadly black spot enters.

Dusting or spraying should be done throughout the time that the plants are in leaf. Weekly treatments are often recommended, but it is better to dust every ten days or even every two weeks than not at all. In dusting there is a knack, easily learned, of sending a gentle cloud of dust up through the plants so that it will coat

the foliage lightly and evenly. Too much dust detracts from the appearance of the plants, and may burn the foliage, especially in hot weather. Early in the season a dust of arsenate of lead will be sufficient; but mixtures such as fine sulphur and rotenone, arsenate of lead and sulphur (Massey dust), are popular, and sometimes tobacco dust is added. There are many dusts put out for roses under trade names; the killing ingredients are named on the labels. There is talk of adding D.D.T. to rose dusts, and experimenting is always going on for better black spot control. At present, the main point to remember is that 3 types of protection are needed: a stomach poison to protect from chewing insects, a contact poison to protect from sucking insects and some of the chewing ones, a fungicide to protect from disease. There are many preparations that combine 2 or all 3 of these types of protection.

1. Chewing Insects. About the middle of May there come the small green well-camouflaged slugs, that eat the green part of the leaves. When these are very bad, the foliage looks dry and brown, almost scorched; they can cause much damage to climbers and ramblers, as well as to

everblooming roses. Small green caterpillars, Japanese beetles, and several other chewing insects attack roses. Arsenate of lead is the best protection. Beetles can be hand-picked, as the opening buds have no protection against them.

2. Sucking Insects. Aphids are the most noticeable; they cluster thickly on the stems below flower buds, and on tender new shoots. White flies become bad in late summer and fall; they are tiny creatures that fly out from under the leaves when disturbed. Their numbers and persistence make up for what they lack in size; they are one reason for fall dusting. Rotenone, nicotine, and pyrethrum are used for the control of sucking insects. These are called "contact" insecticides because they must penetrate the insect's breathing tubes to kill.

3. Diseases. Black spot is the worst; it spreads as the summer goes on, especially in humid weather. Mildew, when it is bad, so shrivels the buds of ramblers that they do not develop; it is always unsightly. Sulphur is the leading dust for black spot and mildew control; sometimes a combination of sulphur and copper is used. Canker is best controlled by pruning.

Harrison's Yellow Rose

McFarland photo



In general, chewing insects are most prevalent the early part of the season, and sucking insects the latter part. Black spot must be fought continually. Control will not be perfect, but the time spent in dusting pays big dividends. Until disease-resisting hybrid teas are developed, dusting is essential. There are other rose pests, and rose fanciers learn all they can about them, and take the time and thought to fight them. This short article gives the elements for those who snatch a few minutes for rose care from a hundred other interests.

Cultivation and Watering

The rose bed should be cultivated during the summer to keep the soil aerated and to keep down weeds; after each rain, it should be stirred up to keep a crust from forming on top. In early summer, a mulch of peat moss, old manure, or ground tobacco stems can be put on, which will need to be loosened up only after heavy rain.

During droughts, a few good waterings will help the plants. It is best not to wet

the foliage unless the watering is done early in the day, so that the leaves will dry before night. Watering should be done thoroughly or not at all. After the top of the soil has dried, the surface can be scratched to conserve the moisture below.

Cutting the Flowers

When roses are cut, it is wise to consider the well-being of the plant. A tall vigorous rose can spare more foliage than one that is meagre in growth. It is best to cut to a strong outside bud and a big fully developed leaf. Remember always that the plant needs its foliage. Keep faded flowers cut the same way.

Winter Protection

When cold weather comes in early December, any extra-long branches on the roses can be shortened to lessen whipping in the wind. Earth is the safest material to use to protect the plants during the winter; but it should be remembered that taking the earth from around the plant is apt to expose the roots to damage from cold and wind. If earth is used from the rose bed, a good layer of compost or manure should replace it; when it is possible, earth should be brought from another place in the garden. Near New York, a mound of earth about 6 inches high should bring a healthy plant through safely. Further north, salt hay or evergreen boughs can be used for a deeper cover. Heavy protection usually means dead wood in the spring, and so bigger bush after pruning.

Final Admonition

In many gardens there has to be scrimping at one time or another. Perhaps the baby's shoes must take precedence over manure; or perhaps there is time before dinner for cultivating or dusting, but not both. My advice is this:—forget the manure for a year, but dust; put off the cultivating, but dust. It is better to risk a winter with no protection from cold than a summer with no protection from black spot.

Rosa odorata

McFarland photo





Roses on Pergola at the Brooklyn Botanic Garden

HOW TO GROW ROSES IN THE CITY

Long Experience at the Brooklyn Botanic Garden

Sidney R. Tilley

THIS is a very practical article about roses, based on experience in the Brooklyn Botanic Garden rose garden. It may seem to have unnecessary reiteration of elementary facts, but there is always someone about to start the adventure of rose growing, and to this one, perhaps bewildered by the reading of the many books and articles on the subject, his article is directed.

It must be understood that beyond a few fundamentals, there is more than one way of helping a rose to grow. The beginner will find the way best for himself by studying his own environmental conditions.

There are many kinds of roses. Wild roses are indigenous throughout the Northern Hemisphere and are the fore-runners of improved varieties. There is always an urge to alter and improve Nature's work; and for centuries hybridizing has been going on, until various marked types have been brought into a fixed existence. These are the tea rose, the hybrid perpetual, the hybrid tea, the polyantha, and the climber. Since the hybrid tea is most generally grown, we will confine our attention to this particular group of roses, and consider their culture from 5 aspects.

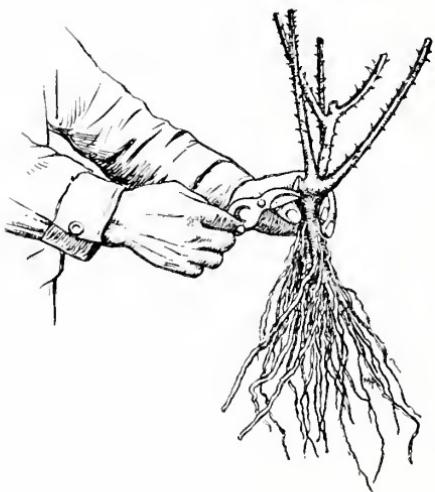
Soils, Fertilizers, and Manures

Roses will grow in almost any soil, but it must be brought into a suitable condition to promote satisfactory growth.

They prefer a rich heavy loam with plenty of humus and good drainage. The proper absorption of water to a depth of 2 feet is essential, for though roses delight in a moist soil, they respond poorly to standing water around the roots. When rose bushes are established and growing well, they are gross feeders. Until then it is better to withhold fertilizers. It is assumed, in making this statement, that the preparation of the ground before planting was properly attended to by the incorporation of well-rotted manure. If this is not available, commercial dehydrated cattle manure may be used. After the June outburst of bloom, it is advisable to give a feeding to stimulate growth in preparation for autumn bloom. Superphosphate at the rate of about 2 pounds per 100 square feet, dried blood at the rate of about 1 pound per 100 square feet, or any complete fertilizer, raked into the surface, is good. In addition to this, roses should be well manured in late autumn.

Planting

Rose bushes should be planted as soon as possible after being received from the



Pruned rose plant ready for planting—showing point of union of stock and scion



Cutting roses:—For long stems cut at A, leaving 2 leaves. The next flower will come from shoots developing at the base of these leaves. If the flower is not cut, then when the petals fall remove the old bloom at B. Several new stems will develop.

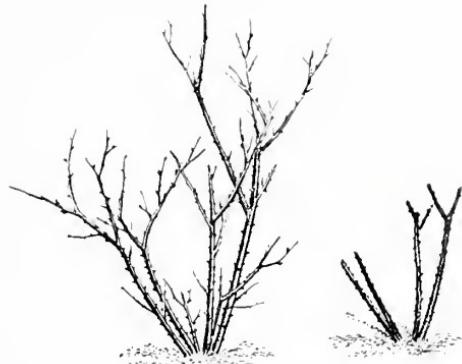
grower. The roots should never be allowed to dry out. Make a hole wide enough and deep enough to spread the roots, and set them so that the crown comes about an inch below the ground level. Pack the soil around the roots so that no air pockets are left. One of the secrets of successful planting is to pound the soil well, around newly planted bushes. If the ground is dry, water must be given before the hole is entirely filled; after it has drained away, the hole is filled in with dry soil. Shorten the cane at the time of planting. In fall planting cut back about one third, but remember to prune severely in the spring to promote quick root growth.

Culture

Frequent cultivation of the surface of the soil is essential to the successful growing of hybrid tea roses, especially when they have dried out after a heavy rain. An endeavour should be made to keep a dust mulch around the bushes by light stirrings of the soil. During long dry spells watering must be attended to by flooding the ground. The way to find out if water is needed is to make a little hole in the ground; if the ground is dry to a depth of 2 inches below the loose top soil, water is needed. Do not spray the tops of the bushes with water, as this may spread fungus disease. All faded blooms should be cut off daily. Nature's main aim seems to be to reproduce, and all the "force" of the plant directed to producing seeds; consequently it is important to remove exhausted blooms, not only to improve the looks of the plant but to throw the strength into the oncoming blooms.

Pruning

In the New York area, pruning of the hybrid tea roses is carried on during the early days of April. Of course the time varies with the season; but when it is noticed that the buds or eyes are begin-



Hybrid tea rose:—left, unpruned; right, pruned

ning to swell, and the prospect of heavy frost is over, then is the time to prune. It is not such a difficult operation as many assume. The principal aim is to cut out dead, weak-growing, or spindly growth; to leave the strongest canes and to shorten them. How far to cut back depends upon whether the gardener wants many blooms to make a garden display, or a smaller number of blooms of higher quality. The shorter the canes are cut back, the better the blooms. To help form a well-shaped bush and to allow a better circulation of air, always cut to an outside eye.



Layering. Branch is partly wounded; bent down and buried about 2 in. deep; covered with soil; held in place with a stone or heavy wire. When rooted, cut from parent plant at A. Upper left shows rooted plant

Insects and Diseases

This aspect of rose growing is probably the most puzzling to the amateur; but it is one most necessary to understand. Remember that prevention is better than cure; and with this idea in mind, endeavour to keep the bushes growing sturdily, watching carefully for any sign of ill-health. Well-grown plants seem to have less attraction for insects and to be better able to resist disease.

Both sucking and chewing insects are attracted to roses. The sucking insects are controlled by contact insecticides, that is by actually hitting the body with a poison. Nicotine is most generally used, and is effective. The chewing insects are controlled by stomach poison; that is, the leaves are poisoned before they are eaten. Arsenate of lead is generally used. The most common sucking insect is the aphis. The chewing insects include caterpillars, rose bugs, and the Japanese beetle. Of late years the Japanese beetle has been an ever-increasing menace; the leaves can be saved by a coated arsenate of lead spray; but to save the flowers hand-picking is necessary. Rose scale may attack the bushes, chiefly on the old wood. When a branch is badly infested, it is best to cut it out at the ground and burn it. The control for scale is a miscible oil spray applied when the bushes are dormant in winter.

The rose is heir to many diseases, including mildew, black spot, and canker. Mildew may be more prevalent, but black spot is the most devastating. Mildew usually appears upon the buds and terminal shoots during damp warm spells of weather; and it is advisable to check it at its first appearance, or it will rapidly spread over the foliage and even on the stems. Dusting sulphur, not flowers of sulphur, is the control. Dusting sulphur is also the control for black spot and canker, and is generally used in the form of the Massey dust, which is 9 parts sul-

phur and 1 part arsenate of lead. Bordeaux mixture is effective, but it badly spoils the appearance of the foliage. There are also many effective proprietary brands of spray on the market.

As mentioned before, hybrid tea roses can adapt themselves to most conditions of soil; but for quality roses, other factors of the environment are important. Plant the bushes well away from large trees, and not too near fences, especially closed ones, so that a good circulation of air can be assured. Roses need plenty of sunshine, at least 4 to 6 hours a day.

Before selecting which hybrid teas to grow, it is wise to find out which sorts thrive best in your own vicinity. Visit other gardens, and the rose gardens of the parks and botanic gardens. Here is a short list of the hybrid tea roses that do well in the rose garden of The Brooklyn Botanic Garden, and presumably would succeed under city conditions almost anywhere.

White: Caledonia, Marcia Stanhope, Margaret Anne Baxter, Mme. Jules Bouche, Neige Parfum.

Red: Charles K. Douglas, Chateau de Clos Vougeot, Christopher Stone, Etoile de Hollande, Margaret McGredy, Poinsettia, Red Radiance, Crimson Glory, Grande Duchesse Charlotte, Heart's Desire, Will Rogers.

Pink: Edith Nellie Perkins, Imperial Potentate, Killarney Queen, Lady Alice Stanley, Mme. Butterfly, Picture, Mme. Leon Pain, Mrs. Charles Bell, Pink Dawn, President Macia, Radiance, Good News, Katherine T. Marshall, Mary Margaret McBride, Ophelia.

Yellow: McGredy's Yellow, Mrs. E. P. Thom, Mrs. Pierre S. duPont, Soeu Therese, Souv. de Jean Soupert, Eclipse, Lowell Thomas.

Bicolor: Betty Uprichard, Condessa de Sastago, Duquesa de Penaranda, Mme. Joseph Perraud, Talisman, California Comtesse Vandal, McGredy's Sunset.

USE OF EMBRYO CULTURE IN ROSE BREEDING

Walter E. Lammerts

EMBRYO culture of rose seeds is a difficult process because of the hard, bony exocarp of the rose seed, which makes it necessary to very laboriously dissect out the embryo with the use of a very sharp knife. Even a skilled operator can only do about 250 to 300 per day; nevertheless, because of the very rapid life cycle resulting from use of this technique, the operation is well worth while whenever varieties are desired which, because of the characters involved, necessarily can only be obtained after several generations of crossing and backcrossing. Thus, seed from crosses made in May can be embryo cultured by August and brought into flower by late October or November. Pollen from these may then be used in backcrossing to either one of the parents or outcrossing to some third variety having a desirable character which should be combined with those of the two original parents, and seed from this backcross will be old enough to embryo culture by February, and the small resulting plants brought into bloom by late April or May, thus getting two generations per year. In this way it is possible in several years to combine characteristics from several different sources which with the usual technique would take from seven to eight years. The method is primarily of value when a rose breeder is beginning some new project such as the introduction of black spot resistance from a variety very near the wild species *Rosa wichuriana*. In this case obviously several backcrosses to the commercial varieties are necessary in order to eliminate some of the undesirable features of the *Rosa wichuriana* parent.

One of the most interesting examples of a rose variety resulting from this technique is one called Debonaire, a very

highly mildew resistant yellow rose which I developed at Armstrong's Nurseries. The rapidity with which this variety was developed was largely due to the saving of time in the initial stages by use of the embryo culture technique.

[The importance of embryo culture in iris was pointed out in an article by L. F. Randolph, in the Winter number, 1945, of *PLANTS & GARDENS* (Vol. I, pages 241-2'6) Ed.]

China Rose

McFarland photo



WALL GARDENS

How to Make and Maintain them

Dorcas Brigham

EVEN those who drive through New England on her main highways can appreciate her stone walls. Those who explore her old roads in leisure become fascinated by these landmarks of the labors of past generations of men, who had first to clear the land, then to win a living from it. Years have mellowed the stones. Along the sunny stretches lichens have further softened the effect. Velvet patches of moss add color where overhanging trees cast their shade, and hay-scented ferns mask the joining of earth and wall. What is more natural for those of us who love this perfect combination of live and static material than to carry it to our immediate surroundings and proceed to garden in stone?

Construction of the Wall

This free-standing wall of our forefathers is one we can use only as a background throughout most of our country; but the earth-filled retaining wall is well adapted to planting, and takes care of that difference in slope which, when made into a grassed terrace, is such a nuisance to mow and maintain. Two points should be kept in mind by the builder. First, the outer face of the wall should be sloped in toward the bank from bottom to top, anywhere from 18 to 24 inches for a 6-foot wall. This is called "the batter" and allows rain to fall over the entire face of the wall. Second, the individual stones must be tilted back into the bank. This throws rain water back into the wall rather than allowing it to run off down the face. The chief concern of the planter is to be sure that the soil in the crevices is continuous with that in the bank against which the wall is built. Spring planting gives a whole

season in which plants may grow into their new location before being subjected to the rigors of winter. If one can plant as the wall is building, so much the better, as this enables the planter to spread the roots well back into the crevices and pack the earth firmly about them.

If the wall is well built, it has its own intrinsic beauty and should not be entirely covered. The plants should serve as additional beauty, not as competition. To get the effect of over-all color at any one time, it is wise to plant certain varieties here and there throughout the wall. Succession should also be kept in mind, and plants chosen which will bloom over as long a period as possible. Interest is heightened when the color of foliage is also carefully selected to give as wide a range of gray and green tones as is possible. I might add that this latter most neglected aspect of planting is surprisingly wide and varied and gives the person conscious of it added delight in plants and gardens.

Plants for Spring Bloom

The opening color note in spring is struck by the varieties of *Aubrieta deltoidea* and wall rock-cress, *Arabis albida*, responding to the first warmth of the April sun. *Aubrieta* Mrs. Lloyd Edwards, with its rich purple petals, contrasts handsomely with double white *Arabis albida* or with the newer deep pink tones of one of its varieties. The more wiry stems of *Arabis procurrens* stand a bit further above its glossy tight-packed rosettes and allow its daintier whiter petals to ruffle a bit in the breeze. The native columbine *Aquilegia canadensis*, soon swings its red petals into the spring song; and the fair little gray-leaved fan columbine, *Aquilegia flabellata* var. *nana-alba*, in spite of this white man's burden, adds a jolly bit of its own, being perfect in stature for this situation. *Nepeta macrantha* tops its

gray-green mounds of foliage with gentle lavender and holds this sustaining note throughout the entire season, softening and blending the effects of the entire wall.

Soon in early to mid-May comes the crescendo of color when golden-tuft, *Alyssum saxatile*, strides into full bloom, dominating the picture and pirating the attention of the casual admirer. Person-

ally I prefer the gentler nature of the variety of *A. saxatile* called *citrinum*, or Silver Queen, since these blend more agreeably with the deep or light blues of the Veronicas which may be planted near them for just this purpose. The gray-green cushions of such pinks as *Dianthus arvernensis* Icomb, *D. arenarius*, *D. neglectus*, and the less compact cottage

A Wall Garden

Gattscho photo



pink, *D. plumarius*, soon are bristling with buds, and then completely covering their allotted space in the wall with varying shades of pink and spicing the air with their fragrance. Should you combine these with the clear sky-blue of the alpine flax, *Linum alpinum*, and add *Anthemis Alzoon*, now opening its lovely white flower clusters, you would have a most satisfying color picture.

Other Plants

A half-dozen kinds of bellflowers, or Campanulas, stud the wall with stars or bells as their habit may be. This is a genus especially rich in wall garden material, both in lavender-blue and in white; and the beloved harebell of Scotland, *C. rotundifolia*, hangs its bells along the wall until November clamps a restraining icy finger down upon it. The Carpathian harebell, *C. carpatica*, with its wide open bells, blooms all through mid- to late summer, the white form being particularly attractive.

One can derive a great deal of pleasure from the habit of growth and coloring of the various hens-and-chickens or *Sempervivums*. These adjust themselves admirably to the top of the wall, where moisture is usually less abundant and exposure greater. Here they may also drop their surplus rosettes from ledge to ledge, making veritable cascades of white or vivid green, as in the cobweb house-leek, *S. arachnoideum*, or *S. soboliferum*. The former has most attractive little clear pink stars when in bloom. One may also choose bronze-red to lavender-gray coloring in the rosettes of various varieties, all of which colors are most striking in early spring before other bloom comes into the wall.

We can also pick and choose among the stonecrops in the extremely large genus *Sedum*. Many are too rampant for the wall; but there is nothing lovelier than *S. Sieboldii*, with its gray-green fleshy leaves edged with rose as the season advances, and its clusters of lovely

rose flowers in September. Another rewarding *Sedum* is *S. Middendorfianum* with rich red foliage in fall and early spring, and yellow midsummer stars. The frosty blue-gray foliage nubs of *S. dasypphyllum*, closely packing any crevice in which they are planted, always delight the observer and are augmented in July by white stars.

One year, by pure chance, a winter savory, *Satureja montana*, seeded in the wall at Village Hill. Few people would think of this as a promising possibility for wall culture, yet it makes a fine glossy-foliaged mound, and in August adorns itself with beautiful contrasting pure white flowers. It has little competition from its neighbors to steal its show.

I have not even mentioned such show material as the gray *Cerastium Columnaria* a more compact, less rampant form than the common snow-in-summer; or dwarf pink *Gypsophila fraternis*; or the dwarf Phloxes like Vivid, Blue Hill, *P. campanensis*, *P. bifida*, or the pure white forms. And there is ample opportunity, if you rocks are limestone, to use the encrusted and other *Saxifrages*. In fact, the material available if you shop around is almost limitless. Each year there are few casualties, as in any garden, which give one a chance to add a few new varieties and make new color combinations.

It is quite true that the wall is much easier to maintain than the horizontal rock garden, fewer weeds finding a foothold, and these few being much easier to remove. Little other attention is needed, it not being advisable to water unless we have an exceptionally dry hot summer. Here indeed is a garden to delight the eye. The enjoyment is amplified for many by the realization that a specific situation has been met with a practical solution. When to the functional is added beauty, we are fairly sure to have a result that is satisfying to a great many people.

HOW TO HELP STREET TREES

*What the Urban Citizen can do
for the Street Tree adjacent to his
Property*

Carl J. Schiff

THE average life of a city street tree is about 40 years, compared with an 80 year average life expectancy of its country relatives growing in forests or natural suburban habitats. Street trees live under unnatural conditions, surrounded by concrete walks and pavement, and subject to such adverse artificial conditions that horticulturists wonder how they survive as well as they do. Adjacent property owners can, with relatively little effort, help their trees survive and even prosper under city conditions.

Point No. 1: Give the street tree in front of your door several pails of water any time the ground is dry. This is particularly necessary during the hot dry

spells in July and August, when a few pails of water given once each week would help the tree survive and maintain a healthy condition. The average layman recognizes that the basic factors necessary for a tree to grow, besides sunshine, are plant nutrients and moisture; nevertheless, every year many trees fail because of lack of water. A tree can be growing in the finest topsoil, and with all of the plant nutrients that are necessary, but these materials will not be absorbed by the tree unless moisture is present.

Point No. 2: Cultivate the tree pit area; keep the soil in a loosened condition to permit water and oxygen to get through to the roots. Watering soil that is hard-packed by pedestrians would obviously serve no purpose, since the water would not penetrate to the root system. It is necessary therefore to loosen the soil surrounding the base of the tree for a distance of 2 to 3 feet and to a depth of

Cultivating the soil around street trees



3 to 6 inches using a sharp implement such as a pick or spading fork, and taking care not to injure any of the roots that may become exposed.

Point No. 3: Add mulch to keep the soil friable. A mulch of 1 or 2 inches of humus improves the physical condition of the soil and prevents its repacking, and also serves to retain the moisture added. An ideal mulch can easily be made by saving the leaves in the fall and piling them in an out-of-the-way spot in the back yard, adding a handful of commercial fertilizer or a small quantity of rotted manure to help decay start, and watering occasionally with a garden hose. A little soil may be added, and the pile turned over from time to time with a spading fork, so that the material will decompose, and be available the following season. This will be returning to the soil what the tree's country cousins obtain naturally.

Point No. 4: Watch for suckers and remove them before they grow too large.

Small buds develop annually along the trunk or at the base of the tree, growing out into slender shoots sometimes 2 to 3 feet long. These shoots are known as suckers. This sucker growth is of no value to the tree, and can easily be removed by pinching the small buds back or cutting the shoots off with a sharp knife when they are only 1 or 2 inches long.

Point No. 5: Keep the tree pit area filled to grade; and if sufficient soil available, form a soil cup to help catch beneficial rainfall.

Point No. 6: Don't pave too close to trees. Many individuals in an attempt to keep the sidewalk neat in front of their homes, illegally cement up the trunk of the tree. This means slow death for the tree. In no case should the sidewalk be laid closer than $2\frac{1}{2}$ feet on each side of the tree. And there should be an absolute minimum of 1 inch on the sidewalk side of the tree. It would be desirable, even here, to keep

Planting of London Planes in a Historic Section of Brooklyn



the walk 2½ feet away, but in many cases this is not practical because of the narrowness of the sidewalk.

Point No. 7: Tell the Department of Parks about unusual tree conditions. In Brooklyn, and indeed in all of Greater New York, the public is invited to call to the attention of the Department of Parks any unusual conditions such as wilting or off-color leaves, trunk injuries, broken or hanging limbs, insects, or similar unusual circumstances. Inspectors are sent to investigate, but since approximately 12,000 such requests are received annually, it is impossible to give immediate attention to every case. Many interested persons, observing small injuries on the trunk of a tree, paint them with tar or roof paint. These materials are injurious. In New York, the rule is that aside from cultivating, watering, and removing suckers, no attention should be given city street trees by adjacent property owners without written permission from the Department of Parks. It is illegal also to post signs on, tie banners to, or drive nails into trees. The public can aid materially by being on the lookout for vandals who oftentimes strip the bark from the trunks of trees, or break branches; and for people who thoughtlessly pile refuse at the base of trees.

Young trees are normally supported by means of wire threaded through rubber hose, to hold them erect. In some cases the tree grows to a point where the encircling wire chokes it. This same thing happens with tight guards. It would be very helpful if such cases were reported so that the tree guards or tie wires could be loosened or removed entirely if no longer needed.

Point No. 8: Get permission and advice before planting street trees. Under the New York City Charter, the Commissioner of Parks is empowered to prescribe rules and regulations pertaining to the planting of street trees. Such planting is the responsibility of the owner of the adjoining property. The Department inspects sites on request and issues necessary permits; and an inspector will supervise tree planting, free of charge, when the property owner wishes to undertake the cost of the tree planting. Similar rules might be found helpful in all communities where no special procedures for tree planting now exist.

Attention to the points above mentioned will insure good street trees, trees to which property owners and public officials can point with pride.

RECENT ADVANCES ON THE WEED-KILLING FRONT

George S. Avery, Jr.

2-4-D weed killer is only two years old, yet a continuous stream of new information is becoming available. Latest uses are the killing of "weed trees" and the destroying of weed seeds in the ground by temporarily sterilizing the soil with 2-4-D.

Killing Weed Trees

Certain weed trees are often more troublesome than the orthodox weeds of lawn and garden, and rarely is it feasible to

spray their foliage. The report now comes, however, from Messrs. Tukey and Hamner of Michigan State College, that 2-4-D will kill certain trees, if applied in higher than usual concentrations, and larger than usual amounts. There seems to be a quantitative relation between the size of the plant and the amount of 2-4-D required to kill it. They prepared pastes and powders of various concentrations and put them into holes bored in a downward direction in the tree trunk, or applied them to notches cut with a hatchet com-

pletely around the tree. Several fast growing trees, such as poplar, were severely injured by such treatment. It is only a question of further experimentation to determine the amount needed to kill the various weed trees under different conditions.

Tukey and Hammer also report that plum trees, willow, and poplar as well, which had been cut down and were suckering from the root, were held in check by smearing the cut surface of the stump with the pastes and concentrated powders mentioned.

Woody plants respond to 2-4-D in a variety of ways. The elm, for example, is very susceptible to 2-4-D, as are many species of *Prunus* (plum, peach, cherry, etc.), including the choke cherry. Junipers, on the other hand, are not readily injured, and hawthorn is somewhat resistant.

Killing Weed Seeds in the Soil

Treating soil with 2-4-D (as little as 1.5 ounces in the top inch of an acre of soil) checks the sprouting of seeds of certain weeds, among them wild mustard, according to Mitchell and Marth of the United States Department of Agriculture Station at Beltsville, Maryland. They report that 2-4-D loses its weed-killing power after a reasonable time, if applied to moist soil. It can therefore be applied to fallow fields in regions of normal rainfall, because it will no longer be there to harm crop plants the following season. In dry soils, however, the compound retains its plant-killing ability for as long as 12 to 18 months. There is much to be learned before soil treatment with 2-4-D can be recommended to the average gardener and agriculturist.

Mixtures of Weed Killers

Hitchcock and Zimmerman at the Boyce Thompson Institute have been experimenting with mixtures of 2-4-D and other chemically similar plant hormones. They report that certain mixtures are more potent killers than 2,4-dichlorophenoxyacetic

acid alone. They also find that 2,4-trichlorophenoxyacetic acid ("trichlor") consistently killed gill-over-the-ground (*Nepeta hederacea*) whereas 2-4-D did not. Trichlor was also more effective than 2-4-D in killing white clover and oxalis. Weeds growing in soil were more easily killed than those growing in sand. For those interested in the chemical side of the problem, Hitchcock and Zimmerman state that acids, salts and esters of 2-4-D and the propionic homologs are about equally effective.

Only Small Doses Needed

Harold H. Smith of Cornell University calls attention to the extremely small amounts of 2-4-D needed to kill susceptible plants. As little as one pint of solution will kill over an area of 20 to 40 square yards. A fine fog spray was found to be a less efficient way of applying 2-4-D than a coarser-droplet spray.

Plants Successfully Attacked

And here are several additions to the already long list of troublesome weeds that 2-4-D will destroy: from Washington comes the news item that wild onion "have been banished from the socially impeccable White House lawn"; and also that Japanese honeysuckle can be completely destroyed by two sprayings during the season. From Puerto Rico it is reported that nut grass, an agricultural weed-pest of the first magnitude, succumbs promptly upon 2-4-D treatment. And from Florida comes the important news that the water hyacinth, famous for clogging the waterways, drainage ditches and lakes of subtropical regions, is killed by spraying with 2-4-D.

Lower Costs

The price of 2-4-D has dropped considerably within the past year, because of greater usage and greatly increased amounts manufactured. In common with all products, the price will undoubtedly go lower still, as usage increases.

GRAFTING: NEW INFORMATION FROM AN OLD PRACTICE

Where do Tobacco Leaves get their Nicotine?

Ray F. Dawson

NICOTINE is produced by the tobacco plant, morphine by the opium poppy, and quinine by the cinchona tree. These three substances all occur in nature—along with the caffeine in coffee and atropine in the jimson weed—and are known chemically as alkaloids. The uses of morphine as an anesthetic, quinine as an anti-malarial, and atropine for dilating the pupil of the eye, are all well understood. Important medical practices thus hinge on certain alkaloids from plants.

Although the alkaloids have such marked and often specific effects on humans, little is known about how plants take them. Indeed, one of the more fascinating problems in biology concerns the manner in which plants produce the many different chemical substances we call drugs. How is it that plants can take and accumulate them without disturbing their own growth? And where do plants are they made? The latter question is answered in this discussion, or by pressing into service the ancient art of plant grafting, the answer was discovered.

Tobacco usually contains from about 1 percent to as much as 4 percent of the highly poisonous alkaloid, nicotine. It accumulates principally in the leaves of the plant, and apparently has something to do with giving satisfaction to the tobacco smoker. But nicotine is also one of the best known insecticides, and is extracted for this purpose out of the scraps from the manufacture of smoking tobacco. In addition, it is readily converted into

niacin, the anti-pellagra vitamin. The importance to man once established, it is clear that we ought to know more about the production of nicotine in the tobacco plant.

Plant physiologists had noticed that tobacco leaves continued to accumulate nicotine as long as they remained alive on the plant; but that when removed for hanging in the curing sheds, they invariably ceased to accumulate the drug. This fact gave the clue which led to the discovery that nicotine is not manufactured at all in the tobacco leaf, as botanists and growers had long assumed; but if not in the leaves, where? This was where the old practice of plant grafting became a new tool for discovery; and scientists working in India, Japan, Russia, Germany, Italy, and the United States, each apparently without knowledge of the others, performed the same basic experiment. They grafted the green tops of tobacco plants on the root systems of tomato—a closely related plant¹ which contains no nicotine. They also grafted tomato scions on tobacco root stocks, and allowed them to grow until they formed large vines. Subsequent chemical analysis revealed large amounts of nicotine in the tomato leaves growing on the tobacco root system, but none in

¹ Successful grafting or budding depends on a fairly close relationship between the plants being grafted. Plants of the same species intergraft readily (different varieties of apple, for example); plants in the same genus, but different species, intergraft satisfactorily (such as plum on peach or almond); plants of different genera, but in the same family, often intergraft successfully (in the nightshade family, tobacco, tomato, jimson weed, potato, etc., will all intergraft); plants in different families rarely intergraft, though 2 or 3 exceptions have been reported.

the tobacco leaves growing on the tomato root system! The riddle was solved. The tobacco roots produce nicotine, and it moves up through the plant to the leaves, where it is stored. For those who have sought nicotine-free tobacco, here is the answer: graft the young tobacco stem and leaves on tomato root stock.

Now about atropine, that curious drug the oculist uses to dilate the pupil of the eye. It is produced by the jimson weed (*Datura Stramonium*), which intergrafts with tomato fully as successfully as does tobacco. When jimson weed shoots were grafted on tomato root stock, growth was luxuriant, but neither stem nor leaves contained as much as a trace of atropine. Tomatoes, on the other hand, grafted on

jimson weed roots, accumulated large amounts of atropine in their stems and leaves. It is obvious that here again drug formation occurred only in the roots of the jimson weed.

Not all drugs are produced in the roots of plants, however. Anabasine, one of the tobacco alkaloids and an insecticide widely used in Russia, is produced both root and shoot of the tree tobacco (*Nicotiana glauca*). Experiments with the pepper plant whose fruits are used to make tabasco sauce, show that the hot taste of the fruits is not diminished by grafting tabasco shoots to the roots of sweet pepper plants. And similarly sweet peppers grown on tabasco roots do not become hot.



A NICOTINE-LESS TOBACCO PLANT IS OBTAINED BY GRAFTING A TOBACCO SCION ON A TOMATO ROOTSTOCK.

SEEDS OF SUCH TOBACCO WILL GROW INTO NORMAL NICOTINE-CONTAINING TOBACCO PLANTS.



A TOMATO PLANT GRAFTED ON A TOBACCO ROOTSTOCK IS SUPPLIED WITH NICOTINE BY THE ROOT SYSTEM.

SEEDS OF THIS TOMATO PLANT WILL GROW INTO NORMAL NICOTINE-FREE TOMATO PLANTS.

There seems little doubt that the ancient practice of grafting will reveal still more of the *terra incognita* of plants. About quinine production in the cinchona tree, and morphine in opium poppy, we still must learn.

Here is another brief report, from plant grafters in the South. In certain southern agricultural areas, soil nematodes (minute round worms) cause great damage to the tomato crop by injuring the roots of the plants. Someone discovered that tomatoes would grow and

produce fruit fairly well when grafted to nematode-resistant jimson weed roots, and the information was passed along to tomato growers. The question immediately arose as to whether tomato fruits grown under such conditions would be poisonous, because of the presence of atropine. The final answer on this point is yet to come, but it appears that in most cases the drug does not accumulate to a dangerous extent in the ripening fruits.

WITHIN THE BOTANIC GARDEN

COMMUNITY PLANTING FOR CIVIC BEAUTY

Practical projects to beautify the community were discussed at the Garden's first post-war conference on Community Planting, held on April 3. Most communities have given little or no attention during the war years to problems of civic improvement. Since pre-war leaders in community beautification have largely gone to other tasks, there is need for encouraging

new leadership. The object of the Conference was to stimulate groups as well as individuals to see the problems and organize community effort toward solving them. The proceedings, in part given below, have been published in full.*

* They may be obtained by writing to the Secretary, Brooklyn Botanic Garden.

CIVIC PLANTING, A POSTWAR CHALLENGE

Address by John C. Wister

Very few American cities, towns or villages have been wisely planned. Manufacturing districts have been mixed with residence and retail business districts. Transit facilities, water supply and sewage, and parks have suffered from lack of planning. The rapid growth of towns and the development of slum areas have also been unforeseen.

We all live in some community. Yet we have not put as much intelligence, skill, money, or enthusiasm into community planning as Henry Ford did in designing a single model of his car, or a good housewife does in arranging her kitchen. Whatever planning we have done indi-

vidually has been in and around our homes, forgetful of the larger problem of the community.

We cannot escape the problems of one community by moving into another. Practically every community has similar problems, which could have been avoided by wise planning, by careful zoning, etc. It is only within the last twenty-five years or so that most communities have even made a start in the needed direction.

Present Conditions

During recent years all communities have deteriorated under the strain of war conditions. Care, labor, and effort had to be, and rightly were, centered on war production. Now we have come to a time when it is not only possible, but absolutely

necessary to begin to make our communities tolerable places in which to live. We must reexamine the needs of the community.

One of the needs of the community is for new and improved parks, planted with proper trees, shrubs, and flowers. Here is some picture of what horticulture can do to make our parks better.

Types of Parks

Large cities can have elaborate parks, parkways, botanical gardens, etc. Smaller communities cannot afford these but even the smallest village should have some street trees, athletic grounds, and picnic grounds.

The least expensive type of large park is the town forest. This can cover many acres at a small cost can provide protection to water supplies, or from erosion and stream flooding, will return some cash benefits from trees cut, and can be used in part for recreation.

More extensive are recreational parks that have baseball fields, tennis courts, etc.

Even comparatively small parks can make some kind of horticultural display. This is particularly true in the smaller communities which do not have serious smoke problems. Many different species of trees can be planted. They should be labeled, so that persons interested can learn the difference between an oak and maple, between a pine and a hemlock, between a lilac and a mock orange. Great floral displays can be had from small trees like dogwoods, flowering crab apples, flowering cherries, peaches, etc., and from large shrubs like the spiraeas, viburnums, mock oranges, lilacs, etc. Even a small community park would have room for a dozen or twenty-five named varieties of lilacs which would make a much more interesting horticultural display than merely a mass of the same number of common lilacs.

Soil

New parks must be built, and old ones remodeled and thoroughly replanted. The soil in most parks has been neglected.

Some years ago a million dollars was spent in Central Park for new soil. Yet it could provide only a part of the needed soil on that rocky terrain, where much soil has been washed away by rain and carried away on the shoes of visitors.

Often poor to start with, soil in the city deteriorates faster than it does in the country. Park soils need sympathetic care from officials who understand the biological processes of the soil.

Street Trees

Many of the trees and shrubs planted in our parks and on our streets have been unsuited to their purpose. The spring issue of "Plants & Gardens" contained a plea for more diversified street planting. When a single species is planted by the mile, the appearance of a new disease may endanger all the trees. Nature does not plant trees in that way but mingles many species in our woods—oaks, maples, ash, gums, and many others. We would do well to follow nature's ideas.

Park Trees and Shrubs

Horticulture should be a great aid in making our parks better. Superior varieties of trees and shrubs have been discovered or developed since many of our parks were originally planted. These should be used in place of some of the kinds now superseded.

Certain unhappy aspects of planting conditions are familiar to us all:

(1) Parks have been planted for "immediate" effect, trees and shrubs too close, soon becoming overcrowded with no chance for the individual plant to develop its maximum beauty.

(2) Planting has been done with inexpensive trees, such as poplars or soft maples, or with no great variety of trees. This may have been done to save money at the time; or because the person in charge had no horticultural training; or perhaps most often because no better trees happened to be available in quantity at reasonable prices in nearby nurseries.

(3) Planting has been done without knowledge of soil requirements of natural

nourishment, or of natural associations. The study of ecology in horticultural schools is comparatively new.

(4) Planting has been done before the development of modern improved varieties, or without interest in them, or knowledge of them.

(5) Planting has been done without a real desire to give maximum beauty of bloom, or of fruit, or of autumn color, and apparently with no perception of the value to the human spirit, of extreme beauty as exemplified in great masses of flowers.

(6) Planting has been done without realization that "it is not the initial cost, it is the upkeep." Comparatively inexpensive plants which have to be replanted one hundred times a century, cost more in the long run than the most expensive trees and shrubs, which once planted, live many years.

Influence of the Parks Upon Individuals' Horticultural Education

Coupled with horticultural displays there is opportunity in communities for adult education in horticulture. There should be opportunity for small groups of people to meet with park officials to learn about their trees, about shrubs which are hardy and suitable for back door gardens, and about perennials and bulbs. A good park superintendent welcomes the opportunity to meet with such groups of people, to encourage and inspire them to clean up their back yards, and plant flowers.

Some years ago, the Missouri Botanical Garden had an exhibit of two back yards, side by side, one unattractive and filled with rubbish, the other simply but nicely planted with a few shrubs and with flowers like hollyhocks. This small example probably influenced many thousands of people to improve the conditions immediately surrounding them.

What Amateur Gardeners Can Do to Help Civic Beauty

Any private citizen interested in gardening can do much to help beautify his

community. The fact that he likes flowers and believes in beauty enables him to encourage others; to influence municipal authorities to take better care of existing parks and to construct new ones; and to force the appointment of trained, rather than untrained, horticulturists as park superintendents.

Small neighborhood associations should encourage and cooperate with park officials in doing their job well. Many park officials have been glad of the opportunity to do a better job when the public demand forced their superiors to approve beautification projects and to provide the funds to do the work. Some twenty-five years ago a park superintendent in a large city asked permission to go to the Arnold Arboretum to gather tree seeds to make the beginning of a future arboretum. The cost was little beyond his railroad fare and a few additional cold frames in the park nursery. His immediate superior in the city hall said, "Why do you want to go to all of this trouble; take it easy; you are sitting pretty."

Wide-awake citizens and groups of citizens are the only means of removing conditions of this kind. If we were aware of the need of more beautiful conditions in and around our communities we would have them. A conference such as this can do much to point out what needs to be done and how to do it.

Popularity of Floral Beauty

People like gardens and parks. This has been proved over and over again in the past quarter of a century, yet many city officials have not found it out.

Railroads before the war ran special trains to Washington to see the Japanese Cherries. They did not do it to promote appreciation of beauty. They knew the public wanted to see beauty and they expected this public desire to bring business to the railroads. It did. The famous Flowering Cherries at the Brooklyn Botanic Garden attract forty to fifty thousand people a day at the height of bloom.

When a Rochester newspaper recently conducted a poll of school children to find

out what they considered the most important features of their city, Rochester University, Rochester School of Music, Eastman Kodak Company and other similar features of the city received thousands of votes, but taken altogether the parks received more than any of the others. Rochester probably has done more for its parks in the last half century than any other city anywhere near its size. It is famous for its lilac collection, its crab apple collection, its peonies, and many other flowers. The development of these parks has cost great sums of money. The poll of the school children shows that they have been appreciated and that people want them.

The Scott Foundation of Swarthmore College has planted on the college campus examples of trees, shrubs, and flowers which are hardy and suitable for planting in any suburban or city gardens within a radius of several hundred miles of Philadelphia. In the short space of sixteen years and with very limited funds, this planting has become well known, attracting people from nearby and distant parts of the country.

The Brooklyn Botanic Garden, much older than the Scott Foundation, is in the midst of a large city and is host to more than a million visitors yearly. Its many gardens within a garden show what may be grown in the city and provide urban

dwellers an opportunity to see something beyond city pavements and tall buildings. Its classes offer instruction in gardening and horticulture.

The Opportunity Ahead

Education in horticulture such as is given at the Brooklyn Botanic Garden should be offered in many places. It need not be as elaborate, nor on so large a scale. Neither should it be technical. It should offer simple information and help to the many individuals who have an urge to grow plants. Cannot some of you who are attending this Conference start a small class in horticulture in your own community?

This great garden in Brooklyn is doing a wonderful work. So are the many other Botanical Gardens and Arboreta scattered over the country. Their work is entirely inadequate, however, in proportion to the enormous size of the problem which confronts us. There are many millions of people who want the knowledge and the inspiration that gardens can give. Each community should do something in the way of park development, community planting, and community horticultural education. Won't you who have attended this meeting, go back to your home cities, towns and villages and see what you can do there, this year?

HOW TO USE YOUR NEWSPAPERS EFFECTIVELY IN COMMUNITY PROJECTS

Address by
Dorothy H. Jenkins

Community planting for civic beauty cannot be accomplished by keeping it a secret.

There is no hocus-pocus about what gets into a newspaper. The decision is made solely on the value of news. Whether a story is two inches or two columns long, its omission or its appearance, as well as how much appears, depends on its newsworthiness.

If you have ever written a letter to the editor and it has not been published, it is not because the managing editor has a grudge against you. Ten to one, it did get into galley form but perhaps the day it was scheduled to be published, some delegates walked out of the UN and local news, therefore, was completely overshadowed. When space was available again to print more letters, the urgency of your letter had become outdated.

The greatest number of people are still reached through newspapers. Probabl-

ney are reached through local as well as metropolitan papers. Whether you live on Long Island or in Springfield, Massachusetts, we of the New York newspapers would like to think that either *The New York Times* or *The New York Herald Tribune* is your metropolitan paper, although, whether daily or weekly, large or small, your local one.

There is a great difference in the type of story preferred by metropolitan and local newspapers. The city newspaper emphasizes what has been done or said that is actually news to the greatest number of persons. The local paper is distinctly interested in the residents of that community who have had anything to do with the event. Two entirely different but simple news stories are needed, if anyone is to publicize a meeting through these two different channels.

Take, for example, this conference here today. I shall go back to my office and write a story based on the important points (in my opinion) that the speakers have made and on what has been accomplished. But if a story were going to be written also for a paper in Connecticut, that editor would be interested in the events through the eyes of the local people who had attended and would certainly include their names in the account and possibly why they had been there.

It is certainly possible for anyone to write a simple account of a conference, meeting or event that will be published in the newspaper in which it is desirable for it to appear. By this, I do not mean actual reporting but information which will be of value to an editor. We do not want literary efforts—we want facts put down simply and clearly in logical fashion. An editor will much prefer to do any embellishing himself in the style of his publication. Such information should be typed, if possible.

It is not necessary to intercede in order to get a story printed. A newspaper is at a social office. And, if the story is

not news, the fact that you are the editor's oldest friend or that he personally is intensely interested in the project will not get it into the paper. A telephone call is permissible and more than welcome if it insures the account reaching the office before the deadline. Weekly, daily and Sunday newspapers have their deadlines, often surprising ones to an outsider.

An advance story presenting the essential facts of the forthcoming meeting is always a wise move. Sometimes, things are not news after they have happened but the fact that they are to take place is news. It does not matter how far in advance—within reason—this story reaches the editor. He will file it so that it will come to light at the proper time for publication.

Any newspaper story must answer five questions: what, why, how, when and where. These, told simply, may be all that is necessary. Be certain that these five facts are stated, however many other interesting points may be added. Accuracy is also essential. In fact, "accuracy, terseness, accuracy" sum up the essence of the news story.

Loose talk is as unnecessary and advisable for newspaper recording as in the dangerous times of war. If you do not wish to be quoted, say so quite frankly, I can assure you that you will not be, if you say so. But if you wish to be quoted, then be very certain that your statements are true, correct, and accurate.

Big spreads of an accomplishment in community beautification or civic planting are heartwarming to those who are responsible for them and to others who may be stimulated by them. By this is meant the use of extensive space to tell what has been done with pictures and words. But these spreads must be earned by making a plan or project a reality. To do this the cooperation of many people must be obtained. What better way can this be done than through newspaper accounts, however long or short, appearing over a long period?

"HORMONES AND HORTICULTURE," AT THE NEW YORK FLOWER SHOW

After a lapse of four years because of the war, the International Flower Show was resumed this year at Grand Central Palace March 18-23. This was the 44th annual event and the Garden's tenth consecutive participation in it.

Plant hormones had their day at the Garden's exhibit this year. Hormones at work was the theme—in a very correct horticultural atmosphere created by an apple orchard and a lawn, both enclosed by a cedar rail fence. The many practical applications demonstrated were proof that plant hormones (growth-regulating substances) have progressed from the researcher's test tubes to common use in amateur and professional gardening and

horticulture. Although naturally-occurring hormones exist in plants, the greatest strides in chemical control of growth have been made with synthetic hormones.

Of the several ways the hormones control plant growth, the following were included in the display: rooting of cutting, ripening of fruit, control of sprouting of potatoes, production of seedless tomatoe, prevention of preharvest drop of apple, thinning of apples, and weed killing lawns.

For sure-fire results in rooting many types of cuttings, hormones are the answer. Cuttings of several species have been made two weeks before the Flow-

Portion of Exhibit showing demonstration of natural and hormone-induced responses in plan-





Control of fruit drop by hormones, and weed killing by 2-4-D

Show, dipped in hormone powder,* and planted in sand. In good form for the display were the roots of treated cuttings of hibiscus, grape and English ivy, pachysandra, peperomia, lantana, and yew. The non-treated controls, of course, rooted poorly in the two short weeks.

Home owners with lawns full of weeds found solace in the weed-killing exhibit. Several varieties of lawn grass and the weeds which infest them were sprayed with the weed-killing hormone, 2-4-D.* The grass survived, since 2-4-D is not injurious to lawn grasses. The following weeds, however, were destroyed: dandelion, dock, narrow-leaved and broad-leaved plantain, etc.

Other "wonder workers" are the hor-

mones that speed the ripening of fruit picked green, and those that prevent potatoes from sprouting. Green bananas dipped momentarily in a very dilute solution of 2-4-D (2-4-D in more concentrated amounts is the weed-killer) ripen in twenty-four hours. Unripe apples and pears so treated ripen in a short time also. Potato sprouting in storage can be prevented by dipping the potatoes in a hormone solution (not yet on the market) or by dusting them with hormone powder.

Seedless tomatoes were novelties to many visitors. Although a back-yard project for the amateur, some commercial growers produce them by the bushel with hormone treatment. For best results in producing seedless fruit, the tomato flow-

* A partial list of commercial preparations of hormones available at seed stores:

Weed Killing	Seedless Fruits	Preharvest Drop	Rooting
Root-an-all	Seedless Set	Parmone	Stim Root
Tufor	Fruitone	Fruitone	Hormodin
Dandy-Kill	Tomato Fix	App-L-Set	Rootone
Weedone		Apple Lok	Quick Root
2-4 Dow Weed Killer		Hormex	
Karmex		Niagara Stik	
Scott's 4X Weed Control		Stafast	
Weedicide		Stop-Drop	

ers are sprayed with a water solution when they begin to open.

To demonstrate the prevention of pre-harvest drop in certain apple varieties, by hormone treatment, the history of two apple trees in the "orchard" was portrayed. One tree had been sprayed with hormone solution when its apples showed the first signs of dropping, the other tree was not sprayed. The sprayed tree retained its crop; the unsprayed lost much of its fruit in a preharvest drop. Hormone preparations also thin blossoms, if the trees are sprayed while in flower. This, of course, reduces the number of apples maturing, but increases the size of those that remain.

A hormone explanation lies behind the everyday phenomenon of the bending toward light of such plants as begonia and geranium. Under the influence of light from one direction, the hormones in plant accumulate on the shaded side of the stem, causing it to grow and bend toward the light.

Plant cancers received their share of attention. They were produced by applying hormones to the stems of sunflower and tomatoes. The result—an abnormal growth of tissue, a condition similar to tumors in animals.

SALLY KELLY

FORSYTHIA DAY—APRIL 10, 1946

Forsythia now has a spiritual meaning in Brooklyn. Mrs. Edward C. Blum's enthusiastic efforts resulted in 1940 in forsythia being proclaimed the official flower of the Borough. A continuation of her efforts and a generous gift to the Garden have led to the establishing of Forsythia Day as an annual event. This year the program was designed to emphasize the spiritual meaning of the flower, and Mrs. Blum participated by reading her spiritual message (printed in PLANTS & GARDENS, Spring 1946, pp. 61-62).

The program in full was follows:

Invocation, Rt. Rev. Edward P. Hoa
V.G., P.A.

Opening remarks, Philip A. Benson
Chairman

Reading of the spiritual message, Mr.
Edward C. Blum

Address, Dr. L. Wendell Fifield

"America the Beautiful," Everett Clark

Closing words, Dr. George S. Avery, J.
Benediction, Rabbi Isaac Landman

DEDICATION OF THE TUCH GATE

The feature event of this year's Spring Inspection, held on Tuesday, May 14th, was the dedication of the Tuch Gate at the Eastern Parkway entrance to the Garden. The gate has been described in the Winter 1945 issue of PLANTS & GARDENS, page 251. The dedication ceremonies were brief:

Presiding: Mr. Philip A. Benson,
Chairman of the Governing Committee.

Presentation: Mr. Michael Tuch.

Acceptance: Dr. George S. Avery, J.
Director.

The donor's plaque reads: "This gate the gift of Mr. and Mrs. Michael Tuch
Citizens of Brooklyn, 1946."

The architect for the gate was M.
John M. Kokkins, formerly a member
of the Department of Parks, City of New
York.

Hygrade Iron Works, Inc., Brooklyn,
New York, constructed the gate, under the
direction of Mr. L. Hirschorn.

AMONG THE CONTRIBUTORS TO THIS ISSUE

EUGENE S. BOERNER is in charge of Research and Rose Breeding for the Jackson & Perkins Nursery, Newark, New York.

DORCAS BRIGHAM, of Williamsburg, Massachusetts, is Instructor in Botany at Smith College and the owner of the Village Hill Nursery, specializing in rock plants.

MR. AND MRS. WALTER BROWNELL, Little Compton, Rhode Island, have been breeding roses for hardiness for many years.

DR. JOHN B. CARSON is a Philadelphia physician who has made a hobby of growing and exhibiting fine roses.

DR. RAY F. DAWSON is Assistant Professor of Botany at Columbia University, New York City, and has devoted many years of research to alkaloid production in plants.

ETHELYN E. KEAYS (Mrs. Frederick Love Keays), of Great Neck, Long Island, has long been a student of old rose lore. She is the author of "Old Roses," published by the MacMillan Company.

DR. WALTER E. LAMMERTS was formerly Ornamental Horticulturist of the University of California at Los Angeles, and is now Plant Breeder of Rancho del Descanso, at La Canada, California.

MARY DEPUTY LAMSON is a New York landscape architect.

DR. J. HORACE McFARLAND, Harrisburg, Pennsylvania, was for many years Editor of the American Rose Annual, and has done more than anyone else to foster American rose growing.

C. EUGENE PFISTER of Chicago is President and Chief Rosarian of the Men's Garden Clubs of America.

CARL J. SCHIFF is Arboriculturist of the Borough of Brooklyn, Department of Parks, City of New York.

GERTRUDE M. SMITH is a garden consultant of Montclair, New Jersey.

DR. HENRY K. SVENSON is a member of the Garden staff.

SIDNEY R. TILLEY was for many years in charge of the Rose Garden of the Brooklyn Botanic Garden.

RICHARD S. WILCON is Chairman of the Test Garden Committee of the Minnesota Rose Society and Director of the American Rose Society.

GERTRUDE ALBION WRIGHT (Mrs. Richardson Wright) of Silvermine, Connecticut, is an enthusiastic gardener and student of old roses.



PLANTS & GARDENS

Autumn, 1946

layout of the Small Place

—

Wild Flowers

Conservation and Garden
Culture

—

Daffodils

—

Ragweed and Hay Fever
Control



BROOKLYN BOTANIC GARDEN
OF
THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

Officers of the Institute

EDWARD C. BLUM

Chairman, Board of Trustees

ADRIAN VAN SINDEREN

President

WALTER H. CRITTENDEN

First Vice-President

CHARLES PRATT

Second Vice-President

SIDNEY W. DAVIDSON

Third Vice-President

EDWIN P. MAYNARD

Treasurer

JAMES E. GIBBONS

Secretary

Ex Officio Members of the Board

The Following Officials of the City of New York

THE MAYOR THE COMPTROLLER

THE COMMISSIONER OF PARKS

Botanic Garden Governing Committee

PHILIP A. BENSON, *Chairman*

MISS HILDA LOINES, *Vice-Chairman*

EDWARD C. BLUM, *Ex officio*

WILLIAM G. CREAMER

WALTER H. CRITTENDEN

LEWIS L. FAWCETT

MRS. LEWIS W. FRANCIS

ANDREW J. GONNOUD

WALTER HAMMITT

WILLIAM T. HUNTER

EDWIN P. MAYNARD

LEONARD P. MOORE

ROBERT MOSES, *Ex officio*

JOHN C. PARKER

DONALD G. C. SINCLAIR

BERNARD H. SMITH

ADRIAN VAN SINDEREN, *Ex officio*

Director of the Botanic Garden

GEORGE S. AVERY, JR.

PLANTS GARDENS

Early-flowering cherry, *Prunus subhirtella*

NEW SERIES

Autumn, 1946

VOL. 2—No. 3

CONTENTS

Cover.....	Cranberry-bush, Viburnum Opulus
Frontispiece.....	Willows and Pool in the Botanic Garden 130
Director's Letter.....	131
Lilliputian Landscapes.....	Frederick W. G. Peck 132
<i>Articles on Wild Flowers</i>	
Can We Hope to Tame the Wild Flowers?.....	Edgar T. Wherry 135
Families of Wild Flowers.....	143
How to Grow Wild Flowers for Pleasure.....	Minnie May Johnson 144
Wild Gardens.....	A. F. W. Vick, Jr. 150
Wild Flower Conservation in New England.....	Kathryn S. Taylor 155
Ground Covers Under Trees.....	Hester M. Rusk 161
Notes on Wild Plants.....	165
Calochortus.....	Elmer C. Purdy 170
A City Wild Flower Garden.....	Henry K. Svenson 174
<i>Miscellaneous Articles</i>	
American Daffodil Selections.....	Jan de Graaff 180
Some Hybrids of <i>Lilium Willmottiae</i>	F. L. Skinner 185
"Operation Ragweed".....	Philip Gorlin 187
Within the Botanic Garden.....	190
Among the Contributors to this Issue.....	Page 3 of cover

Unless otherwise credited, drawings by Michalena L. Carroll and Margaret F. Piper. Photographs by Elsie M. Kittredge or Louis Buhle unless otherwise credited.

JOHN C. WISTER, *Editor*



WILLOWS AND POOL
IN THE
BROOKLYN BOTANIC GARDEN

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN 25, NEW YORK

Autumn 1946

ABOUT THE SPECIAL FEATURE OF THIS ISSUE - WILD FLOWERS:

Wild flowers usually come to our attention in the spring when it is blooming time rather than planting time. But autumn is the time to make plans and to plant many kinds. Editor Wister has selected a group of authors who not only know wild flowers, but know how to grow them in captivity.

This number of PLANTS & GARDENS is dedicated to those who have discovered the charm of a wild flower garden - and to those who have not. May the latter make the discovery while reading this issue.

FOR THOUGHT AND ACTION:

Important in the list of plants noxious to man is ragweed, the wind-borne pollen of which bears top responsibility for autumn hay fever. It is a cold fact that people need not suffer from ragweed troubles any more than from bedbugs, fleas or malaria, but somehow we have not yet come to the realization that tolerating flowering plants which have a bad effect on health is just as unnecessary and unclean as tolerating disease producers of the animal kingdom.

One of this year's great events in the world of plants and man is the ragweed eradication campaign undertaken by the Health Department of the City of New York, an account of which appears in this issue of PLANTS & GARDENS. Ragweed has long been the subject of legislation, but only sporadic attempts have been made to lead it to extinction. The chief reason for this was the lack of a suitable tool for eradication. We now have such a tool in 2-4-D, a chemical harmless to man, beast, and soil, if properly applied, but fatal to ragweed and numerous other pestiferous plants.

The New York Health Department is to be congratulated on its adoption of the new tool developed by botanical researchers. Other communities may well follow the example, and a country-wide campaign would do untold good.

Watch for the announcement of the Garden's Second Postwar Conference on Community Problems with Plants, to be held in the Spring of 1947. Present plans call for devoting the conference to the eradication of plants noxious to man.

Sincerely yours

George L. Avery Jr.
Director



View of *allee* from lily pool (from "B" on plan)

LILLIPUTIAN LANDSCAPES

*How to Plan for Beauty, Utility,
and Serenity*

Frederick W. G. Peck

Drawings by the author

PAINTINGS and poems are judged not by bulk or volume, but rather by the fitness of the ideas expressed and the sense of effortless unity achieved in form, line, and color. Landscape design can attain as high excellence in a small property as in a large; but this excellence depends on *design* as much as on *horticulture*, on *planning* more than on *planting*.

Beauty, in landscape as well as in another creation of man, depends on unity, directness, simplicity. The landscape should be a useful one, too. In order to achieve these qualities certain division of the property should be made so that each section can serve its particular function without encroaching on the character of the others. In general the small property can usually be subdivided into 3 main functional parts: (1) the front yard or semipublic sector; (2) the service yard or housekeeping sector; and (3) the private living or garden sector. Let us discuss each part individually and see what purposes it serves and what character should express.

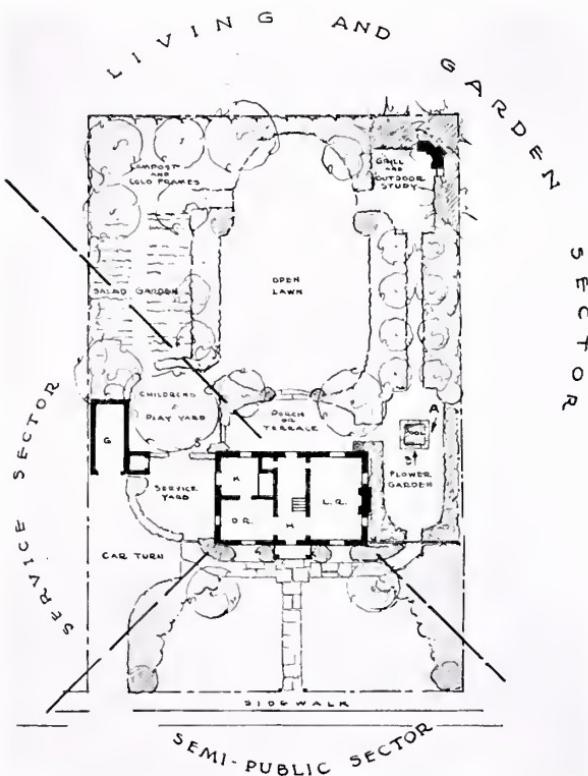
Front Yard

The front yard or semipublic sector should present a dignified and not too highly personalized aspect, not fussy with flower beds, arbors, rock gardens, and specimen shrubs, but a simple welcoming setting for the house with a direct path, open lawn area framed by trees and shrubs and perhaps separated from the street by a fence or hedge. Save your whimsicalities and exoticisms for the garden area and present a clean, smiling but suave face to the public. It sounds easy—but how rare is the front yard which really expresses simplified dignity and serves as a fitting setting for the house itself.

Service Yard

The next area to be designed is the service sector. This should be located adjacent to the kitchen door, providing enough space for trash and garbage cans, the drying yard, the garage and car turn, the oil tank intake or coal window, the tool shed, compost pile, and cold frames. There should be a direct path to the kitchen door for the delivery boy. This is the housekeeping sector for the house and garden and should be laid out so that it functions as such, without encroaching on the other areas and destroying their pleasurable and visual possibilities. The service sector should be enclosed, screened off from the rest by a wall, fence, or

Plan



hedge at least 6 feet high, just as we design a kitchen or bathroom as a separate room.

Garden

The third general sector is the private living area, the garden, the fun department, the place where dreams are born. But remember, if the public gaze has not been excluded and if the washing is flapping in your face, the dreams will be less than noble; so don't start working on this until the other two sectors have been allotted sufficient space and screening. The living area should be in direct relation to the living room, dining room, porch, or terrace. Here is the place for the garden, the lawn, the children's play yard, the grill, flowers, the birds, and you. The integration of one or all of these elements is a challenge in design, but the challenge can be met.

What is good landscape design? What qualities should it have to be as soul-satisfying as our dreams would have it? Liveableness, personality, and serenity seem to be the most important. If a garden has these it can be called fine. These qualities can be achieved in a small place as well as in a vast one. They do not demand large expenditures of money or work. They *do* demand thoughtful planning, good design, the elimination of

everything which does not contribute its share to the unified whole.

The plan shows a lot 100 by 150 ft. developed according to the principles outlined above. The semipublic sector and the service sector fulfill the ordinary requirements of a simple approach and adequate utilitarian area. At the rear of the house a maximum sense of space and distance is achieved by the creation of a broad terrace and an open grass panel down the center of the lot enclosed by massed shrubs and trees. On the garage side is a children's play yard and a fruit-and-salad garden, thus extending the service sector to include these often needed facilities. Off the living room and terrace is the intimate fenced-in flower garden with a small lily pool and with a gate at the front. An *allee* of crab apple or Stewartia trees forms an enticing walk to the outdoor study and grill.

In carrying out this, or any other plan for a small property, the repetition of a relatively few varieties of shrubs, trees, and flowers will have a unifying effect. By using those materials which are small in scale and have a delicate texture the effect of spaciousness will be enhanced. The use of evergreen material in important key locations will carry the landscape beauty through the winter months.



Fenced-in garden (view from "A" on plan)



CAN WE HOPE TO TAME THE WILD FLOWERS?

*A Partial Answer, on the Basis of
25 Years as a Consulting Ecologist*

Edgar T. Wherry

THE expansion of civilization over the surface of the earth inevitably leads to the retreat of the native plants and animals. Fortunately, however, local conditions sometimes make possible the establishment of parks, preserves, or sanctuaries where anyone who so desires can gain pleasure and inspiration from observing the trees, shrubs, and lesser plants in their natural environments. When the areas available lack some of the attractive species which grow elsewhere in the general region, transplantation is often attempted. Unfortunately, however, success does not always attend these efforts to create a wild flower garden. Let us consider some of the reasons.

First of all, it is essential to realize that if Nature really "wanted" a species in the area selected, it would be growing there already. The fact that it is not indicates that the environmental conditions are not entirely suited to its growth. We must therefore consider some of the factors which may be involved, and see what can be done about adjusting them.

A second point: the mere fact that a species comes up the next year after it has been transplanted is not a criterion of successful cultivation. Only when an adult plant begins to produce offspring by seed or other means can the taming of a wild species be regarded as accomplished.

Light

Before a species is moved from its native haunts, note should be taken of its relation to light. Some plants thrive only where they receive full sunlight throughout the day, others under a canopy of evergreen trees so dense that they experience only dim green twilight. Certain early bloomers do best under deciduous trees, where they receive a considerable amount of sunlight at flowering time, but are shaded by the trees' foliage during the summer. It is not especially difficult to select a new home for a species with light conditions similar to those where it originally flourished.

Heat

Along with the light, the sun's rays yield a considerable amount of heat; and this may be important to consider when a plant is to be moved some distance in latitude (or altitude). Every gardener knows that if a species were to be transplanted from Florida to Maine, it would be killed by the low temperatures of the following winter. That there is a reverse relation, however, is rarely realized: this is, that most plants native to Maine, if moved to Florida, would die the following summer because their roots would get too hot. Protection against extremes of temperature may be needed, then, for any plant moved very far north or south (or, correspondingly, up or down a mountain).

Mulchings, frames, and greenhouses are well-known adjuncts for protecting warm-climate species from winter's cold. In nature, soils and the plant roots traversing them are kept relatively cool by shading from the direct rays of the sun during warm periods; by pale colors of soil constituents, so that much heat is reflected; and by evaporation of water which rises from below by capillarity, and turns into vapor as it approaches the surface.

Moisture

Meeting the water requirements of individual plant species is seldom an especially difficult problem. In a newly constructed garden, however, special attention must be given to preventing water from stagnating around roots, and so impeding the access of air to them. The

expression "moist but well drained" may sound contradictory, yet it actually characterizes the substratum needed by numerous native species; those that use very little water as such may benefit by the cooling effect when it evaporates.

Soil

When the more delicate species of wild flowers are to be transplanted, careful attention to the character of the soil into which their roots extend is necessary. This involves not only its depth and relation to the layers above and below, but also the texture, the content of clay colloids and of humus matter. Useful information as to the last can often be obtained by stirring up in a glass of water a bit of the soil taken directly from the root mass, and observing how the constituents settle out.

Wood Lily





Larger Yellow Lady-slipper

The soil reaction (i.e., acidity vs. alkalinity) should not be guessed at by noting the presence of certain weeds alleged to be reaction indicators (most of them are not); it should always be ascertained by actual testing, and only material shaken from the roots themselves should be used for this. The important point to realize is that "sourness" and "acidity" are two entirely different things. A soil which a farmer or horticulturist terms "sour" is merely one in which desired plants grow abnormally; in other words, the term is used in the same sense as when we say that a musician strikes a sour note. Ac-tual tests often show "sour" soils to be alkaline, and not acid at all.

There are on the market a score of testing sets, in which a dye is added to the soil or to an extract from it, and by the color produced the degree of acidity or alkalinity can be ascertained. No high precision is necessary; in most cases, one

needs to find out only whether the reaction is decidedly acid or is instead circumneutral. If the testing set yields "pH" numbers, then a reading of 4 or 5 signifies marked acidity, while 6, 7, or 8 represents circumneutrality.

When such tests are made in sufficient number, several notable features will be brought out. One is that many so-called sour soils are circumneutral in reaction. Another is that there exists in many places an acidity gradient, with the most acid reaction-values at or near the surface, and gradually decreasing acidity at greater and greater depths. (This gradient may be irregular if many earthworms are present, bringing up lime from the depths and depositing it at the surface.) This is the reason why a test of the surface soil may not show the reaction favored by a given plant, if its roots extend well below the surface. Always test soil shaken from the root mass of the plant under investigation.

The texture of a soil in which a species is growing wild is not especially difficult to match; sand, clay, peat, etc., can be incorporated with the garden soil in any desired amount. To produce a circumneutral reaction is likewise a simple procedure: merely introduce a little powdered limestone, or some mature compost or leaf mold (for, contrary to current opinion, tests show these to be circumneutral, not acid).

On the other hand, to make a wild garden acid and keep it so is a matter of considerable difficulty. When the area is small enough, the original soil can be removed to a depth of a foot or two, and the excavation nearly filled with coarse sand; on top of this may be placed a layer of humus obtained from under coniferous trees, or blueberry or mountain-laurel bushes; or peat-moss, rotten wood, old sawdust, tanbark, etc. This

Squirrel-corn

Minnie May Johnson photo





Pitcher-plant

only requirement is that actual tests show these to be strongly acid (pH 4 or 5). The sand will keep out the larger earthworms, the presence of which is fatal to delicate plants of definite acid soil preference. Leaching by the rain will tend to keep the surface acid, but yearly additions of more humus material are likely to be advantageous. When such excavation and filling are impracticable, mixtures of sand and acid humus may be strewn over the surface, and the development of acidity helped along by sprinkling with a weak solution of tannic acid or of aluminum sulfate.

Competitors

In their native haunts plants in general exist in a state of equilibrium with a series of other plants and of animals; and

any disturbance of this equilibrium is likely to lead to the increase of some of these organisms at the expense of others. Unfortunately, a desired plant is just as likely as not to be one of the expendables. Digging a block of earth in which the plant's roots are encased and setting it in a new situation sometimes leaves the equilibrium undisturbed; but frequently even the largest ball of earth which it is practicable to obtain will prove inadequate. In many cases, then, it is preferable to remove all soil from the plant's roots, and encase these in moist sterile sphagnum moss for transportation to their new home. Competing weeds can then be pulled out by hand, and both soil fungi and earthworms can be restrained by watering with weak aluminum sulfate solution.

Some Difficult Species

In the 25 years during which the writer has been studying the problems of wild flower cultivation, reports of failure with certain species have recurred so frequently that the desirability of discussing these individually seems evident. They will be considered in the sequence followed in standard manuals of botany.

Lily Family.—Failures in the transplanting of bulbs of native lilies, Camassias, erythroniums, etc., may at times be due to placing them in soils of too low acidity; the wood lily, *Lilium philadelphicum*, needs the most extreme acid conditions. More often, however, it is due to rodents, such as mice and chipmunks, which are always investigating freshly dug spots, and may devour 100 bulbs in a single night. To deter them, each bulb should be surrounded by an ample ball of $\frac{1}{2}$ -inch rock chips. These may be of sandstone, granite, or traprock, though preferably not of limestone; however, the most important point is that their edges be really sharp. The painted trillium, *Trillium undulatum*, rarely responds to cultivation, since it needs both intensely acid and summer-cool soils, which few wild gardens attain.

Orchid Family.—Some 20 years ago the writer received a call from Dr. Gager, then the Director of the Brooklyn Botanic Garden, asking for help in a planting problem. A huge crate of native orchids had been purchased from a dealer, and presented to the Garden. My recommendations as to the conditions under which each species should be planted were carefully followed, but not a single orchid survived. If the Director had had less breadth of mind, he would no doubt have blamed the consulting ecologist; but we remained on good terms, for he knew as well as I that commercially collected orchids do not often grow anyway. With most species, if a single root is broken, soil fungi invade the plant's tissues, and that's the end of that; and the average collector does not take the time to dig the root system intact. Even clumps dug by

a naturalist with the greatest care fail to survive unless conditions in the garden match those in the plant's native place very closely. There is only one orchid in the eastern United States which can be transplanted with reasonable expectation of its living and thriving, namely, the larger yellow lady-slipper, *Cypripedium pubescens*.

Fumeroot Family.—The delicate dicentras, Dutchmans-breeches and squirrel-corn, require a light-textured, humus-rich soil such as develops on wooded alluvial flats and hillsides. A certain equilibrium among soil microorganisms also seems essential. When transplanted into places where the conditions are even slightly different these plants rarely thrive.

Pitcher-plant Family.—While the northern pitcher-plant grows in the wild in moist sterile humus, it can not withstand stagnation of the water, nor the presence of appreciable amounts of soluble nitrogen compounds in the soil. As these requirements are rarely met, it usually dwindles and dies in the garden.

Legume Family.—The ecologist is sure sooner or later to be confronted with the question, "How can we grow the eastern lupine (*Lupinus perennis*)?". Its extensive root system makes transplantation practically out of the question; but it can be grown from seed. This should be gathered before it is fully ripe, kept moist by litter from the base of the parent plant, and sown in an acid sandbed such as was described earlier.

Milkwort Family.—Everyone who has seen a colony of the magenta fringed polygala, *P. paucifolia*, beautifying a bit of woodland wants to cultivate it; but this is not easy. Its rootstocks extend far and wide, and, as with orchids, injury to one of them is likely to kill the whole plant. If a really broad sod of it is dug, there may be a chance that a few enclosed plants will escape such destruction, and survive in a new home. But the environmental conditions of its native place will have to be matched pretty closely.

Violet Family.—While some violets are aggressive spreaders, the bird-foot or pansy violet, *Viola pedata*, is quite the opposite, rarely surviving more than a year when transplanted; for it needs a porous, sandy soil containing rather sterile humus of subacid reaction, a combination not commonly supplied in the garden. The most successful cultures of it which the writer has seen were in mixtures of sand with sawdust from a pile which had lain in a cutover woodland for 25 years.

Heath Family.—As is now fairly

widely realized, this is the most acid-favoring of all the major families. Most of its members will thrive best if special efforts are made to render the soil acid and keep it so. The one member most often inquired about is, of course, trailing arbutus, *Epigaea repens*. The writer has had success by transplanting it into a sand bed constructed as above described. However, clumps planted so close to the margin of the bed that garden earthworms got in, soon died; a single contact between a worm and a root seems to kill the plant promptly.

Trailing Arbutus



Gentian Family.—The beauty of the fringed gentian, *Gentiana crinita*, leads to its extensive transplantation into gardens, where, being a biennial, it dies in the normal course of events. It can be grown, however, with some degree of success: collect seed as soon as ripe in November, and do not let it dry. Keep it moist preferably by surrounding the capsules with litter from the base of the parent plant. Sow thinly on the surface of a flat of sphagnum moss which has been rubbed through a $\frac{1}{4}$ -inch sieve (a process which is easier than it may sound). As soon as the seedlings are large enough to be handled, transfer them individually to pots of humus-rich loam free from the more vigorous soil fungi and earthworms. As they grow they may be transferred to successively larger pots, but every care must be taken to avoid the slightest injury to the smallest root, for that is almost certain to be fatal. A few days of chilling in a cold

frame in spring will often stimulate the rosette to send up its flowering shoot during the summer. Planting out should be done in a spot where there is a never-failing supply (but no stagnation) of moisture, where there is a considerable acidity gradient (acid on top, circumneutral below) and where the larger earthworms, soil fungi, slugs, etc., are relatively inactive.

The answer to the question with which this article is headed is, then, a provisional affirmative. The more delicate and exacting wild flowers can indeed be tamed, provided we are willing to go to the trouble to adjust the environmental conditions adequately. To attain success requires careful observation and earnest effort; but when a rare and attractive species is ultimately brought to such a thriving state that it begins to increase, the undertaking will seem well worth while to the true lover of nature.

Fringed Polygala



FAMILIES OF WILD FLOWERS

And their Members

THE wild flowers of the northeastern United States belong to more than 50 different families; but anyone who knows even a dozen of the most important families has a good introduction.

There are 2 great groups of families. In one group the plants usually have long narrow leaves, and the flower parts in 3's or multiples of 3. Following are the wild flowers, mentioned in the accompanying articles, belonging to 2 important families in this group.

LILY FAMILY. Six showy "petals"; all "petals" alike (except in trillium and wake-robin).

Bellworts	Star-grass
Blazing star (<i>Chamaelirium</i>)	Star-tulip
Colic-root	Swamp-pink
Dogs-tooth violet	Trillium
Fly-poison	Turkey-beard
Globe-tulip	*Wake-robin
*Lilies	Wild lily-of-the-valley
Mariposa-tulip	Yucca
*Solomons-seal	Zygadenus

ORCHID FAMILY. Six showy "petals"; one of these is very different from the rest, being pouch-like or fringed.

Coral-root	Rattlesnake
Grass-pink	plantain
*Lady-slipper	Snakemouth
Orchis	

In the other great group of families the leaves are usually wide, and the flower parts in 5's or 4's. Wild flowers, mentioned in this issue of PLANTS & GARDENS, and belonging to some of the important families in this group are in the following list.

COMPOSITE FAMILY. Each "flower" really a close cluster of many tiny flowers.

Asters	Coreopsis
*Black-eyed Susan	Daisy
Blazing star (<i>Liatris</i>)	Gaillardia
	Golden ragwort

Goldenrod	Purple coneflower
Groundsel-bush (shrub)	Rosinweed
*Hawkweed	*Thistle
Joe-Pye weed	Tickseed

HEATH FAMILY. All shrubs (except those without green leaves), though some very low.

Azalea	Mountain-laurel
Bearberry	Rhododendron
Blueberry	Rhodora
Bog-laurel	Trailing arbutus
Checkerberry	

BUTTERCUP FAMILY. Usually 5 showy petals; often much-divided leaves.

Anemone	Hepatica
Buttercup	*Marsh-marigold
*Columbine	Rue-anemone
Globe-flower	

ROSE FAMILY. Flowers superficially much alike; many different types of fruit.

Beach plum (shrub)	Hawthorn (small tree)
*Flowering raspberry (shrub)	Rose (shrub)

PEA FAMILY. Usually, but not always, with flowers like sweet peas.

Goats-rue	Redbud (small tree)
Lupine	
Partridge-pea	

PINK FAMILY.

Field mouse-ear chickweed	Sandwort
*Fire pink	Wild pink

PRIMROSE FAMILY.

Loosestrife	Shooting-star
Primrose	

MINT FAMILY. Usually with 2-lipped flowers and aromatic leaves (opposite).

*Bee-balm	Hedge-nettle
Ground ivy	Wild bergamot

FIGWORT FAMILY. Usually with 2-lipped flowers, but not aromatic leaves.

Blue-eyed Mary	Speedwell
Penstemon	*Turtle-head

MUSTARD FAMILY. Four-parted, cross-shaped flowers; pungent juice.

Rock-cress	Water-cress
Toothwort	

* Illustrated in color.

HOW TO GROW WILD FLOWERS FOR PLEASURE

Directions for the Amateur

Minnie May Johnson

Dogs-tooth Violet

Author photo



A WILD flower garden can be a rewarding experience to anyone who has the imagination, persistence, and desire to make his back yard a home for the plants which adorn our woods and fields. It is a real thrill to see the first spring wild flowers from one's own window, and an exciting project to search the countryside for new additions to a wild flower garden. One not only becomes familiar with the haunts and natural settings of native American plants, but one becomes more keenly aware of their variety and beauty.

Learn their Needs

In nature, one may observe that plants live in communities or associations. The individual plant members of each association have specific requirements which are essential for their growth and development. These, of course, must be respected when a wild garden is established. For example, if one examines a pond, he will find certain plants growing there and nowhere else. The same thing is true in a dry cliff association, or in a shaded forest. Sometimes the distribution of wild plants is complicated by different types of soils. Of course, there are some plants which are easily adaptable to a variety of conditions, but these are the more common of our wild flowers.

The first step in starting a wild garden is to study the requirements of the plants which you want to grow, and then try to duplicate these conditions in your garden. Start with the plants which are common in your region. As you build up a fund of knowledge and experience you will be ready to begin introducing plants which are less common in your community.

Plant them in Suitable Situations

Fortunate indeed is the person who has a garden site with a variety of soil conditions. A well-drained, shaded region is ideal for spring flowers such as the dog-tooth-violet, bloodroot, Jack-in-the-pulpit, rue-anemone, toothwort, trillium, wild phlox, Jacobs-ladder, wild geranium, hepatica, wild ginger, and water-leaf. Even more variety is possible if a brook is in the setting; the water's edge is ideal for the water-cress which is so tasty in one's salad, and the banks are good for forget-me-nots, blue-eyed Mary, and jewel-weed. Grace and dignity are added to such a woodland garden by establishing native ferns such as the Christmas fern, the maidenhair fern and the cinnamon fern; and scouring rush may be put in for variety.

No wild flower garden would be complete without such summer flowers as the ox-eye daisy, black-eyed Susan, purple coneflower, Turks-cap lily, penstemon, orange milkweed or butterfly-weed, Joe-Pye weed, gaillardia, tickseed or coreopsis, New England aster, goldenrod, rosinweed and wild bergamot. As most of these plants are native to the prairie and plains regions, they will thrive best in an open and well-drained area.



New England Aster

If by chance there is a dry, rocky area available, why not try a hand at a rock garden of native American plants? This is an ideal setting for them. For early bloomers with color, plant verbena, bird-foot violet, and sedum. Later, let evening-primrose, poppy-mallow, and the Missouri primrose provide the display. Cacti and yucca will add variety and will bloom during the early summer. If the rock garden is slightly wooded, shooting-star, blue-eyed-grass, star-grass, and spiderwort will thrive.

Sedum

Courtesy of Wild Flower Preservation Society, Inc.



Rebuild Unfavorable Environments

Sometimes one is not so fortunate as to have an ideal site for a wild flower garden. If this is the case, by all means make use of the plot of ground just the same, even though it is not ready to plant with wild flowers. In such a situation, it is necessary to rebuild the environment to fit the plants. To a large extent this can be accomplished, but it will require a fair amount of study and experimenting. Considerable satisfaction can come from working out these intricate problems.

Prepare the Soil

Examine the garden site carefully and select a well-drained spot for the flower beds, even though it lacks shade. Now try to duplicate the natural environment for woodland plants. It will be necessary to resort to short cuts since, in a matter of months, one tries to develop an environment which ordinarily takes Nature years to produce. Preparation of the soil should receive first consideration. Keep in mind the soil requirements of the plants which you wish to grow. Most d

Hawthorn

Author photo





Bladder-nut

he common wild flowers are pretty tolerant of any garden soil, while others will grow only in an acid soil.

In preparing for the tolerant group, the oil should be dug up to a depth of about 6 inches. Two thirds of it should be removed, and replaced with leaf mold. About 2 shovelfuls of well-rotted cow manure should be added to each square yard of surface, and mixed in thoroughly. It is a good idea to leave a half-inch layer of leaf mold on top of the soil in order to hold the moisture.

If one is planning to grow "acid-loving" plants such as mountain-laurel, rhododendron, azaleas, and the American holly in a climate which is satisfactory, but where the soil is alkaline, it is necessary to prepare a special bed for them. The soil should be removed to a depth of about 20 inches. After spreading 2 inches of coal ashes over the bottom, the bed may be filled with the following mixture: 2 parts of sand, 2 parts of pulverized peat moss, and 1 part of oak leaf mold. Pine needles and rotted sawdust

may also be added. The newly "made" soil should be tested for acidity. Your County Agricultural Agent or State Experiment Station will be glad to do this if you do not have soil-testing chemicals. Only a small vial of soil is necessary for such a test. If the soil is alkaline, aluminum sulfate crystals (obtainable at the hardware store or drugstore) should be added at the rate of 1/4 pound to each square yard of surface. Dig in the aluminum sulfate, soak well, and test again.

Provide Shade

Now the beds are ready for planting, but are they sufficiently shaded? If natural shade is not available, it will be necessary to resort to artificial shade. If the location is on the north side of a building, perhaps this shade will be sufficient—if one is not confronted with the additional problem of water dripping from the eaves. An artificial shade house will serve nicely until natural shade can be developed from quick-growing trees, shrubs, and vines. There are many ways



Staghorn Sumac

of building a shade house; builders' laths are frequently used. Some gardeners prefer to place posts about 10 feet apart in each direction (inserted in the ground about 3 feet). The posts may be connected with cross pieces, to which coarsely woven wire should be nailed; brush may be woven through the mesh.

Choose and Place your Trees and Shrubs

Now for the planting program: it might be well to begin on shrubs and trees. The object is to make the setting as natural-looking as possible. The effectiveness of the newly-created woodland scene will depend upon how well it is blended into the background, whether one of native trees and shrubs, or a city garden. In some

situations it is fitting to enclose the area with an old-fashioned rail fence; it often adds seclusion and provides atmosphere. Shrubs should be placed in strategic locations in order to cover up unsightly objects, such as garbage cans and naked foundations of buildings. There are many small trees and shrubs which will add color and interest to the wild garden, as well as provide shade. Among the better trees for this purpose are dogwood, redbud, hawthorn, and sassafras. Quick-growing shrubs such as elderberry and sumac may be included, as well as spicebush, hazelnut, wahoo, wafer-ash or hop-tree, bladder-nut, and wild rose. Do not forget to include some native vines such as bitter-sweet, Virginia creeper, and wild grape to add variety. Bitter-sweet may become difficult if it gets out of control.

Transplant Flowers at the Right Time

With the background and shade problems taken care of, one should concentrate on planting the beds. Many of the wild flowers may be obtained from neighborhood haunts; unless these flowers are very abundant it would be much wiser to obtain the plants from a nursery, as no wild flower enthusiast wants to be guilty of tiding in the depletion of our wild life. As a rule, most wild flowers may be moved either in the autumn or in early spring. Since the early wild flowers such as Dutchmans-breeches, dogs-tooth violet, Jack-in-the-pulpit, and spring beauty develop from bulbs, they should be transplanted in the autumn. Late-growing plants like the Virginia cowslip do better if they are moved in July or August. Many of the wild flowers may be started from seeds, but of course it takes much longer to get them well established by this method.

Take Care of the Roots

During transplanting, disturb the root system as little as possible. Be sure to remove plenty of soil with the roots as a protection to the root system. Incidentally, this extra soil will help to inoculate the new bed with the bacteria and fungi which are so important for the successful growth of legumes, orchids, and the Indian pipe. The transplanting operation should be carried on as rapidly as possible to prevent the roots from drying.

There is no doubt about it, wild flower gardening is a satisfaction. Like any other such project, it requires patience, but there is no real rush; take your time. The more one learns about wild flowers, the more enthusiastic one becomes. If the natural environments of plants are duplicated as nearly as possible, the wild flower garden should be a great success.

Wild Rose

Author photo



WILD GARDENS

Advice Based on Professional Experience

A. F. W. Vick, Jr.

If a wild flower garden is a near-replica of a beautiful natural setting, it fulfills the aim of the one who makes it. Replicas of natural settings can be established in small gardens or large; and as every situation is different, the work of establishing a wild garden is extremely interesting.

The wild garden, like other gardens, is ever changing. It differs from the usual garden in that it is never showy; it relies upon intimacy and subtlety for its charm; and the proper selection of plants will bring bloom throughout the year.

Coral-root

Courtesy of Wild Flower Preservation Society, Inc.



Consider that shady spot "where nothing will ever grow," where the annuals never bloom satisfactorily, where perennials languish and die, and the grass is brown before the season is well started. This spot can be transformed into a charming wild garden, a place of beauty for rest and relaxation.

Domesticating the Landscape

On large estates or in public parks and reservations bridle paths, vistas, and trails, with careful and skillful judgment can be made through rough and fascinating country without any real damage to the existing wild setting. Plants can be moved to one side or the other to help gain objectives. Certain branches may prove objectionable, and can properly be eliminated.

Logs on either side of the paths, log rails, bridges, and steps make walkways of interest through wooded areas. Stone walks, terraces, and walls in certain locations may prove artistic. Frequently walls are used without much forethought, and are not suited to the environment. Often for an equal expenditure, a naturalistic rockery would be more effective and far more picturesque.

As conservators of natural beauty, all wild flower gardeners must understand the importance of pruning, feeding, spraying, and necessary care of the plants which already exist on the property. This is an important consideration and should be understood before the development of a project is actually begun.

Trees for the Wild Garden

In selecting a site for a wild garden, it should be remembered that our native plants are happiest under our native trees; and if a great variety of wild flowers is desired, they should be selected

with particular reference to the trees under which they are to be placed. For instance, beech fern is so called because it is commonly found associated with beech trees; it always seems to be at its best when growing in the shade of huge beeches. Wild lily-of-the-valley also thrives when intimately associated with beech trees.

The yellow lady-slipper either is particularly fond of the company of the scarlet oak, red oak, and tulip-tree, or always enjoys the moist slopes where these trees grow best. It is most gorgeous when seen growing with the maidenhair fern on a moist, rich woodland slope beneath the high shade of these magnificent trees.

Jack-in-the-pulpit

Minnie May Johnson photo





Fringed Orchis

Some foreign trees, such as the Norway maple, present a very trying problem in any garden because they are very shallow-rooted, and form a mass of thick, fibrous roots which take all the nourishment from the soil over a wide area. Successful wild gardens, however, have been made under Norway maples simply by spading the ground deeply enough and putting in a mixture of plenty of peat moss and good humus before planting, and then keeping the Norway maple fed by supplying the tree with real tree food placed in drill holes at a depth well below the roots of the wild flowers.

Difficult Places

If the wild garden site is a shady spot between two buildings, it would be well to start with the most persistent wild flowers and ferns, occasionally experimenting with a few of the rarer ones. However, always determine before planting any wild flowers whether the soil is acid, neutral, or alkaline. It is simplest and

best to plant only those that will succeed in the existing soil. Two of the hardy and more tolerant varieties of ferns and spring wild flowers are the hay-scented fern and hepatica. *Arbutus* is a much more sensitive plant; it requires very acid soil and certain bacteria. Because of its great beauty it is highly prized in any garden.

Care of the Wild Garden

One of the best points about a wild garden is that once it is established and left alone, the plants will thrive by themselves. The critical point for a successful wild garden lies in choosing the plants which grow naturally under the conditions found in nearby wild areas.

In planting your first wild garden, remember that until the tiny plants are well established and can take care of themselves, undesirable weeds must be removed; extensive weeding may be necessary for a season or two, and the garden will probably require watering during the hot, dry spells of summer. Once wild plants are well established, however, let them alone.

Do not rake or cultivate a wild garden if it is located in the shade of trees, let the leaves fall naturally and lie where they fall. The most delicate ferns and wild flowers will come up through the leaves without any trouble at all. If the leaves are raked off, almost surely many of the little plants will be killed, as their delicate tips need the protection of the leaves, and those same tips are easily broken when touched by the rake.

If the wind has piled the leaves up in a corner so that they are too thick, they should be removed to a thin coating, because, of course, leaf piles are not natural. If the wild garden is between buildings, it would be well to add a light covering of leaves in the fall. Oak, hickory, tulip tree, birch, elm, dogwood, and sugar maple leaves are to be preferred for this purpose.

Orchids for the Wild Garden

Throughout most of the United States we are extremely fortunate in having a wealth of native material. Among all the glorious wild flowers, orchids seem to attract the most attention. In our quest for exotic flowers, we overlook many of nature's richest jewels among the things we tramp down carelessly on our rambles through the woods.

Around Philadelphia, where this article is written, there are approximately 40 different varieties of orchids. Some are dull, drab, and inconspicuous, and some highly decorative and extremely colorful. For instance, there is the rams-head lady-slipper, with a small inconspicuous flower of a rather dirty reddish hue and ordinary foliage, which is valuable only because it is so scarce. There is the white lady-slipper which is inconspicuous but dainty and rare. The green fringed orchis is so much like the surrounding ground cover in the woods on a moist, fertile hillside that it is most difficult to find even when it is present. But contrasted with these is the beautiful yellow fringed orchis which is extremely gay and brilliant with tints of gold and yellow; and the gorgeous large purple fringed orchis, which will doubtless take its place in the windows of the exclusive florists' shops all over the country, when it can be grown and handled commercially. The exquisite white fringed orchis is unsurpassed for real delicacy and beauty. Many, many more of these gorgeous flowers await discovery by the wild flower gardener.

The rattlesnake plantain has an inconspicuous greenish-white flower and is prized for its variegated evergreen foliage. It needs rich woodland soil, and seems to prefer moist slopes. It blooms in the latter part of spring. The showy orchis has dainty purple-and-white flowers and beautiful shiny green leaves. It will stand some acidity and will sometimes grow in practically neutral soil. It usually blooms in June and July. Both of these plants are comparatively easy to transplant.

The coral-root is one of the most thrilling of all the orchids; it is especially interesting because of the way it appears in the most unexpected places throughout the woods, usually on rich hillsides with southern exposure and high shade. It usually blooms in August and September. We have never been able to transplant it successfully, but its beautiful coral color and the unusualness of its being leafless with coral-colored stem and roots make it particularly fascinating. It is frequently mistaken for one of the fungi.

The pink lady-slipper or moccasin-flower requires very acid soil and does not like to be disturbed. It blooms in May. Picking or cutting the flowers is almost always fatal to the plant. The home gardener frequently finds a place for it beneath pines, hemlocks, azaleas, or rhododendrons. It normally prefers shade, but it must have high enough shade to have plenty of ventilation. And while it is sometimes found growing on very dry hillsides, it is extremely apt to dry out after being transplanted if it is not given the proper amount of moisture until it has had a chance to establish itself. There is a white form of this plant which is considered rare and is highly prized in all orchid collections.

The yellow lady-slipper has two forms, one large and one small. Both are extremely colorful and not exacting as to soil conditions. It prefers rich, well-drained hillsides with plenty of moisture and a northern exposure. None of the blossoms of these plants should be picked.

The culture of our native orchids has been sadly neglected; and some of the most beautiful ones are subject to serious diseases and attacks by insect pests as well as the human pests who insist upon gathering them although they should never be picked.

A Wild Flower Nursery

Our nursery contains only native plant material. Unlike other nurseries, most

of its 70 acres is wooded, with a few acres devoted to the sun-loving wild plants. There is wide variation in soil moisture conditions, including streams, ponds, and bogs, which enables us to place the delicate wild flowers in their proper habitats.

Propagating and growing wild plants is a fascinating business. Many wild seeds take 2 years in which to germinate. The common Jack-in-the-pulpit is slow in developing, but once established may thrive for 25 or 30 years. A good many native ferns must be 5 years of age before they reach salable size. The tril-

liums must be at least 5 years old before they are of blooming age.

We start many wild flowers in green houses and cold frames, and others out of doors. Each plant is an individual, and therefore many experiments must be tried. We know very little compared with what we have yet to learn.

More and more, garden enthusiasts are coming to the realization that native plants give them the opportunity to develop their properties in ways that will give them countless years of satisfaction and a different kind of charming, quiet pleasure.



Trillium



WILD FLOWER CONSERVATION IN NEW ENGLAND

*Old and New Methods, on Small
and Large Scales*

Kathryn S. Taylor

Less Efficient Ways

SOME years ago, before the need for the conservation of our natural resources became so generally understood, ideas about the best way to protect rare wild flowers from annihilation were not very helpful. A negative program was encouraged, and everyone was told what *not* to do, with little constructive advice being given. Nature lovers who discovered good stands of choice native plants did nothing to preserve them except to swear one another to secrecy as to their whereabouts and to promise not to reveal such locations indiscriminately. The fact that these enthusiasts were able to restrain themselves from picking or digging up these plants seemed reason enough for hearty self-commendation and a sufficiently adequate point of view towards conservation as well. Although many wild flowers were doubtless kept in existence by this method, many which might have been spared if experiments in their propagation had been undertaken while the stands were still abundant, have disappeared entirely. For example, one well-remembered colony was that of the climbing fern, *Lygodium palmatum*, which persisted for years on the edge of a woodland close beside a well-traveled highway leading to a Massachusetts city. Those who knew about it watched silently as the area was gradually turned into a dump. They saw the delicate fronds of the fern

twining over old bedsprings instead of over twigs and grasses, finally becoming hidden forever under an accumulation of rubbish. Although the climbing fern is not easy to establish in gardens, persistence would have found the way to do it, and many new plantings might have taken the place of the original colony.

Much time and effort have been wasted when wild flower lovers and garden club groups have tried to maintain small local sanctuaries and to bring into one area a variety of plants each requiring its own peculiar environment. This is not possible on the type of land usually available. One insurmountable obstacle which immediately presents itself is that of carrying water during the weeks when the plants are struggling to adapt themselves to uncongenial surroundings; if the season is abnormally dry, the situation is hopeless. When no policing can be done, the best plants are often found to be missing when the workers make their next visit to the sanctuary. When such projects are attempted by groups depending mostly for success upon the crusader's zeal, the rare plants almost certainly disappear within a few seasons in spite of the most devoted attentions of the flower lovers. Droughts, floods, and hurricanes which have successively plagued New England in recent years have completed the ruin of some sanctuaries which might otherwise have met with fair success. The best way to carry out projects of this sort is to cooperate with other conservation organizations. The Pleasant Valley Wild Flower and Bird Sanctuary in Lenox, Massachusetts, is a good example of such concentrated effort.



More Efficient Ways

If garden club groups interested in sanctuaries would plan a campaign to re-establish wild flowers in locations where they have disappeared but where they were once abundant, this would be an achievement which could do much to further other aspects of the conservation program. If the program were well publicized, local pride and understanding would help to check renewed vandalism. Trailing arbutus, *Epigaea repens*, and large marsh-pink, *Sabatia dodecandra*, are two of New England's best-loved wild flowers which could be restored to areas where they were once common. Both are gathered in quantities when in blossom, and sold to motorists along the roadsides, and are used for home decoration generally. The pink lady-slipper, *Cypripedium acaule*, is a third member of this vanishing group, but it usually cannot be kept alive in a new location for more than a few years, and valiant attempts should be made to prevent its being picked. It is only where the lady-slippers grow naturally that there can be hope of increasing their number.

The policy of urging children, particularly, not to gather choice wild flowers to sell along roadsides for trivial amounts is admirable and is beginning to show results; but looking at conservation from a broader outlook, it should be realized that this selling is not always the only reason why colonies of such plants are eventually wiped out. A motorist may virtuously abstain from buying any wild flower blossoms, no matter where sold; but a lighted cigarette butt tossed from his

car may kill more plants in the resulting forest fire than an army of pickers could destroy in a season. Such fires are increasingly severe on Cape Cod, where most of the arbutus is found, and the problem is far from solution.

The task of moving large numbers of plants from regions where it is known in advance that they are to be destroyed cannot usually be done on a scale that is very imposing. When the new Quabbin Reservoir, storing water for the city of Boston, was in the process of construction, and it was known that the whole area around Enfield, Massachusetts, was to be inundated, members of the New England Wild Flower Preservation Society formed an expedition and brought back many ferns and wild flowers to plant in public sanctuaries and individual wild flower gardens. Although the number of plants saved was insignificant when compared with the total number included in the area, many of the rescued plants are thriving as well as in the spots from which they were taken, or even better.

The planting of small wild gardens or private places can do much to perpetuate native species in local neighborhoods, and this type of garden is very popular at present. Those desiring such gardens however, must first learn the soil, light and moisture requirements of the plants they intend to grow. Many people have little knowledge of the importance of humus, and of the fact that a sufficient amount of it in the soil can balance other unfavorable conditions. Visitors to an intelligently cared-for nature trail, no matter how short, are often inspired to



have a similar one; and if the fundamentals are understood, the probability of success is frequently greater with the wildlings than with cultivated plants, which seem more and more susceptible to disease and insect pests.

Some of the choicest wild flowers, which conservationists have placed on the list of those not to be picked, even in moderation, are readily propagated from seeds and are fine subjects for the back-yard garden. Columbine, *Aquilegia canadensis*, and cardinal-flower, *Lobelia cardinalis*, are two outstanding plants in this group. A nursery row of cardinal-flowers in good garden loam has grown to enormous size, with long flowering stalks that can be picked freely. Columbine will grow in stony soil almost wherever the seed is dropped.

There is much still to be learned, however, about the requirements of many wild plants now considered extremely difficult to establish outside their unique environment. The harts-tongue fern, *Phyllitis Scolopendrium*, is one of these. Yet a small plant of this interesting fern, purchased from the Brooklyn Botanic Garden for 25 cents some years ago, has propagated itself freely under benches and on bricks and upturned flower pot saucers on the earth floor of a sun-heated pit greenhouse. It has become practically a weed there. The ground has never been limed; and so, in this case, a limestone region is not the limiting factor in growing it. A plant of the climbing fern, which demands acid soil, is equally at home in a flower pot in the same pit. It has not been repotted for years, nor been pampered in the slightest degree; but every spring it sends out just as many pale green fronds as when the clump flourished among the bedsprings in the locality already described. Seeds of the fringed gentian, sown as soon as ripe, germinated like weeds in the pit in spring and lived for some years in a moist, sunny field. A prolonged drought finally weakened the gentians, and so this experiment must be repeated.



New England Wild Flower Preservation Society

The first organized effort to further the protection of native plants in New England was made in 1922 when the New England Wild Flower Preservation Society was formed under the auspices of the Garden Club of America and the Massachusetts Horticultural Society. This Society was the first to sponsor the teaching of conservation in the schools. For years a Conservation Week Pamphlet was provided for the use of teachers in the Massachusetts schools, during the spring season, covering such subjects as Wild Flowers, Soil, Birds, Fish and Streams, and Trees. The idea has proved so valuable that the State now carries on the work with its own funds. Nature camps for the further instruction of the teachers have been well attended, and the programs offered are continually being improved.

Fringed Gentian



The Society furthers its work by distributing leaflets on various subjects connected with the protection and propagation of wild flowers. There are 25 such leaflets which are very popular. One, giving lists of New England wild flowers to pick freely, moderately, and not at all, respectively, is much used for reference.

The Society has taken a leading part in discouraging the use of mountain-laurel, and ground-pine and other running evergreens in Christmas decorations. At the fall flower shows in Boston exhibits of wreaths and garlands using only the common evergreens have done much to influence public opinion. A contest for the best-decorated department store using Christmas greens on the approved list attracted wide attention and helped to publicize this educational venture.

Both mountain-laurel and American holly are needlessly ruined every year by commercial gatherers of Christmas greens. The fact that this is often done on private land without the permission of the owner is one reason why the use of these greens is discouraged by the Society. If the laurel is properly cut there is no longer objection to its use.

Extensive experiments to improve the American holly and to grow it commercially are being made on Cape Cod. This is certainly an excellent way to conserve so fine a native tree.

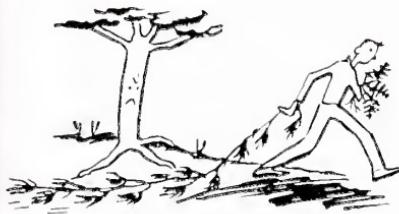
Letters are received from all over the country asking how the Society carries on its work; and two similar societies one in Vancouver, B. C., the other in Toronto, Canada, have been founded on the principles of the New England Society.

In recent years the influence of the Society has been broadened by increased cooperation with other conservation groups. The Board of Directors includes representatives of the Massachusetts State College, Rhode Island State College, the Trustees of Public Reservations, and the Massachusetts State Beautification Committee of the Department of Public Works. A chairman appointed for each state in New England also is included on the Board.

Money formerly allotted to the Conservation Week Pamphlet is now given to the Massachusetts Audubon Society, which offers specially trained teachers to give splendid conservation courses in

Harts-tongue Fern





schools willing to share in the expense. The demand for these classes is growing, and the favorable reaction of the pupils is apparent. In one town, when a woman was seen gathering a large bunch of lady-slippers, the children were infuriated. When remonstrated with, the woman apologized "and said she thought they were "just wild flowers" and therefore might be picked freely. Ignorance is still an important reason why such deprivations continue.

Instead of the older hush-hush practice, places where interesting growths of native plants exist are taken over in Massachusetts, whenever this is feasible, by the *Trustees of Public Reservations*, "a voluntarily supported, privately administered Trust to preserve for public enjoyment beautiful and historic places in the State." In the Berkshires there is a remarkable limestone outcrop known as "Bartholomew's Cobble" which is one of the latest acquisitions of the Trustees. The New England Wild Flower Preservation Society has accepted the invitation to sponsor the Cobble and to advise as to its maintenance, with a warden provided by the Trustees. This is a fine example

of cooperation; and the hundreds of rare maidenhair spleenworts, purple cliff-brakes, walking ferns, wall-rues, ebony spleenworts, columbines, harebells, and other choice plants which abound here are now safe for the enjoyment of all who love the native plants of New England; in this place there is no longer need for concern over their possible extinction.

The preservation of native wild flowers depends on many conservation practices, and the subject cannot be covered by any one set of rules and principles. So-called progress must continue, and no one can stop the building of new roads and the draining of swamp lands. If scientific research and experiment find a sure means of propagating plants that cannot be preserved in any other way, these treasured flowers will gladden the hearts of future generations, in sanctuaries and private gardens the country over, for many years to come.



WILD FLOWERS IN COLOR

On the Following Pages

Of the following eight pages of color illustrations, the middle four pages are from pictures of truly wild plants in their wild haunts. The illustrations on the other four pages are from pictures of plants under cultivation. Some of these are essentially like wild plants of the same species: spiderwort, Oswego-tea, Solomons-seal, lady-slipper, Virginia bluebells, and bleeding-heart. The forget-me-not shown here has flowers a little larger than most wild ones. The rose-mallow has petals a little deeper pink and a little broader than the usual wild one. These are the kinds of changes that often result from man's selection among the naturally occurring variations which he finds in the wild; for no two plants, no two flowers, no two leaves, are exactly alike; and some of the variations are inherited. Selection is going on all the time in nature, too—selection in favor of the strongest, hardiest, most adaptable, and most aggressive kinds. But man is more likely to choose beauty of form or color, which, as often as not is com-

bined with a lack of hardiness or adaptability.

The common northern wild turtle-head has white or faintly pinkish flowers. In contrast, the southern kind has deeper pink flowers and much broader leaves. The one illustrated here has the leaf form of the northern, and the flower color of the southern species. The columbine shown here is like the native eastern one in color, but slightly different in details of form.

We are learning to cultivate our native plants. For a long time we thought more highly of foreign plants, or horticulturally developed ones; and in a number of cases, people in other countries had to teach us to appreciate our own—by taking them abroad, and sending them back to us as garden plants. But now we are aware of our own wealth.

Flowers of all seasons are included in this collection. For those who wish to plant them in their gardens, autumn is a good time to begin planning, and is the proper time to obtain and plant many of the early-blooming kinds.

The wild flower illustrations on color pages 3 to 6 inclusive, are presented through the courtesy and cooperation of Life Magazine and Mr. Rutherford Platt.

Wild Flowers

Spring — Summer — Autumn



Rose-
mallow



Spiderwort



Solomons-seal



Bee-balm



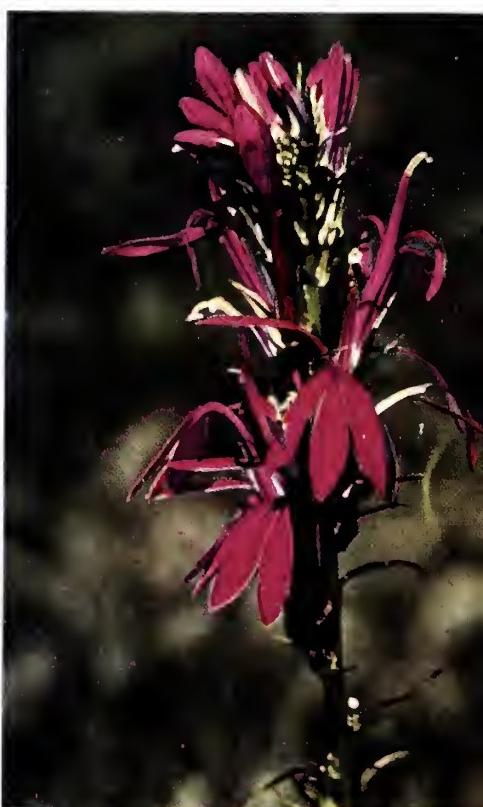
Turtle-head



Fire Pink



Thistle



Cardinal-flower



Black-eyed Susan

Orange Hawkweed





Queen Annes Lace

Meadow Lily





Marsh-
marigold

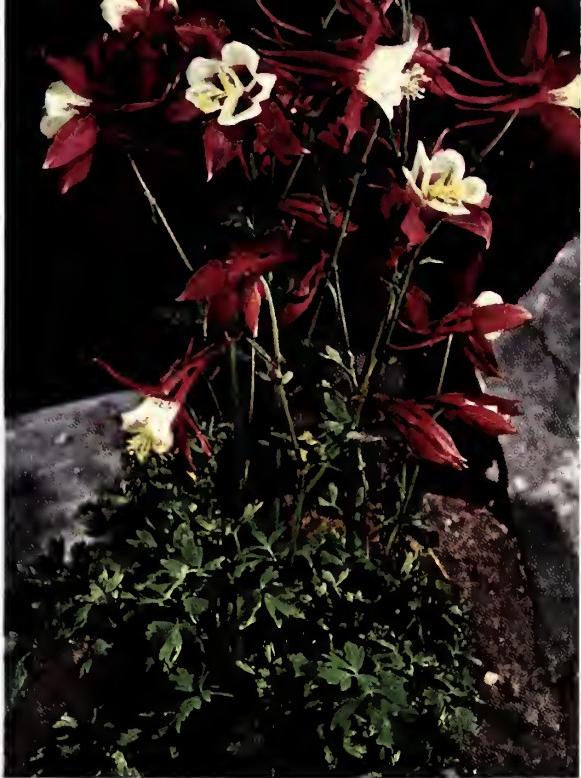


Flowering
Raspberry



Wake-robin

Columbine



Pink Lady-slipper

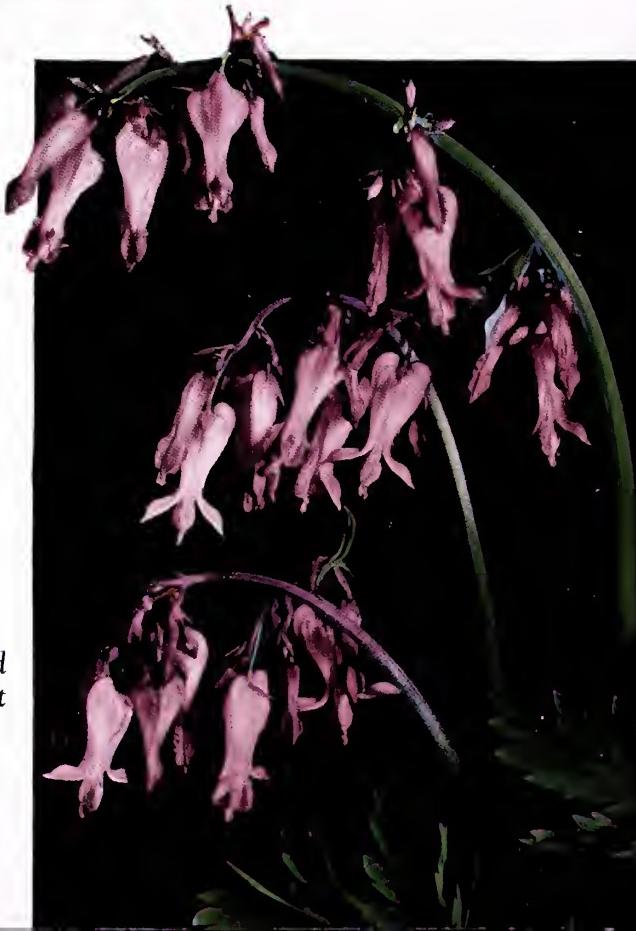


Virginia Bluebells





Forget-me-not



Wild
Bleeding-heart

GROUND COVERS UNDER TREES

*Wild Ferns and Flowers to
Beautify the Bare Spots*

Hester M. Rusk

"THE grass will not grow under that tree; what shall I do?" The thing to do is to give up trying to make the grass grow there, and put in some shallow-rooted plants that naturally do well in the shade. Within certain limits we can make plants do what they were never "intended" to do, as is amply set forth elsewhere in *PLANTS & GARDENS*; but in many cases the best plan is to watch and see what they do naturally, and take advantage of their own "inclinations" by working with them along those lines. Grass is primarily a plant of the open—plains and prairies; but what do we find in the woods, covering the ground with long-lasting foliage which is hand-

some in itself without the adornment of any flowers? Ferns, of course. To many people ferns are just ferns; but actually there are many kinds of ferns, differing not only in the form of their leaves, but in their manner of growth and in their requirements as to light, moisture, and soil.

Ferns

While we ordinarily think of ferns as plants primarily of moist shady situations, there are some that actually do better in the sun, provided they have plenty of moisture at their roots; these would not be suitable for planting under trees. There is one, the hay-scented or boulder fern (*Dennstaedtia punctilobula*), that regularly thrives in open dry places, although it does grow in moist shady situations too. This is a good one to plant under trees because it is so adaptable,

Broad Beech Fern



and because it has running underground stems that quickly spread their leaves evenly over a large space, sometimes over too large a space! It is easily recognized by the distribution and form of the leaves, which are long and graceful, finely cut and very lacy-looking, usually about 1½ feet tall. Toward the end of the season the leaves become brown and ragged-looking at their bases.

Two other ferns that have running horizontal stems (and hence leaves fairly evenly scattered) are the sensitive fern and the broad beech fern. The sensitive fern (*Onoclea sensibilis*) grows typically in very wet places, either in the open or under trees; but it also thrives in drier soil if it has plenty of shade. It is one of the first plants to be killed by early frosts. Its leaves are of a distinctive bluish green color, deeply divided into broad smooth thin segments, not at all finely cut or lacy-looking, usually about a foot tall. The broad beech fern (*Phegopteris hexagonoptera*) regularly

grows in woods that are not swampy and so it is preeminently suited to the purpose under discussion here. Its leaves are usually less than a foot tall, broadly triangular, and more finely divided than those of the sensitive fern.

The New York fern (*Dryopteris noveboracensis*) grows naturally in the same kind of situation as the broad beech fern. Its leaves are formed in definite separate small clumps, but it is easy to have so many clumps that the ground is well covered. This fern is easy to recognize by the fact that its leaves are conspicuously tapering at the base as well as at the tip. It is a delicate, ornamental fern although its leaves are not quite so lacy as those of the boulder fern. It usually grows about a foot tall.

The lady fern (*Athyrium Filix-femina*) grows in a variety of situations; it is often found with the New York fern, with which it is sometimes confused because its leaves are narrowed a little at the base (and they grow in clumps); but

New York Fern in the Brooklyn Botanic Garden





Periwinkle

they never run down to a fine point at the base, and they are lacier, i.e., more finely divided. It grows about 1½ feet tall.

Theoretically it would be especially fine to have some of the evergreen ferns planted under trees; but as a matter of fact, in the city the normally evergreen ferns commonly die down in the winter the same as the others—probably because of unwholesome gases in the atmosphere. Understanding this, however, one may have as ground covers to enjoy during the growing season, 3 of the so-called evergreen ferns. All 3 grow in clumps; and all are often found on hillsides, hence it is clear that they do not require a great deal of moisture.

Laciest and most delicate-looking of all, the American shield fern (*Dryopteris intermedia*) would never be expected to be evergreen. It is one of the least known of the wild ferns; yet it is probably the one most often seen in cities, for it is the "fancy fern" which florists use in their bouquets (when they use a real fern at all and not the so-called asparagus "fern"), and which butchers use to dress up their meats. It stands up well for these uses because of its natural tendency to be evergreen. It can easily be distinguished from the lady fern by the fact that its lowest leaflets are unsymmetrical. It is usually about 1½ feet tall.

In sharp contrast is the Christmas fern (*Polystichum acrostichoides*), thick and leathery, much resembling the Boston fern so well known as a house plant. It is easy to understand that this fern should be evergreen, yet in the city it is not so and its leaves are inclined to be a little curled and unhealthy-looking all through the growing season. It is a typical "shade-loving" plant. It usually grows less than a foot tall.

Also thick and leathery, but broader and more finely cut, is the marginal shield fern (*Dryopteris marginalis*), standing up in elegant-looking clumps 1 to 2 feet tall, all through the growing season.

Even the ferns in this small and selected group differ somewhat in their requirements; but all agree in needing a soil composed largely of leaf mold. Every fall for several years they should be given a top dressing (about 2 inches thick) of woodland soil, or (by way of imitating this) of leaf mold mixed with a little sand. Even after the ferns become established and begin to spread, the leaves that fall from the trees should be left among them, for these leaves will provide a good mulch for the winter and will contribute to the formation of the right kind of soil in future years. The ferns with running stems are especially quick in spreading, but those growing in

clumps are likewise easily propagated by division of their underground parts. Ferns may be transplanted any time if a generous ball of earth is taken and if they are kept thoroughly watered until they are established; but it is safest and easiest to transplant them when they are dormant; and the more faithfully their natural environment is reproduced, the better they will thrive.

Flowering Plants

For lower-growing ground covers with flowers, one can use one of a number of shade-tolerant plants that spread by stems running horizontally on the surface of the ground or below. Several of these are evergreen, such as the native checkerberry—or teaberry or aromatic wintergreen (*Gaultheria procumbens*), with little pinkish white flowers hanging down in summer, followed by long-lasting bright red berry-like fruits; periwinkle or trailing myrtle (*Vinca minor*), with bright blue flowers (about an inch wide) in spring; or—half-evergreen—Japanese

honeysuckle (*Lonicera japonica*),* with the familiar showy white and yellow fragrant flowers, which however are not likely to be produced in the shade. Of the following, which are not evergreen, all are native but the first: ground ivy (*Nepeta hederacea*), with little round scalloped leaves, and small clusters of little light blue 2-lipped flowers in early summer; common speedwell (*Veronica officinalis*), with hairy oval leaves, and dense little upright clusters of tiny blue flowers in summer; woodbine or Virginia creeper (*Parthenocissus quinquefolia*) with big 5-parted leaves, and inconspicuous flowers followed by small blue berries; and Canada mayflower (*Maianthemum canadense*), sometimes called wild lily-of-the-valley, with broad smooth shiny leaves, and little upright clusters of tiny white flowers in May, followed by soft speckled red berries in late summer.

* Recommended only for places where it can be controlled. Often a troublesome and destructive weed, it can be curbed with 2-4-D.

Speedwell



NOTES ON WILD PLANTS

Dates of Bloom, Habitats, and Conservation Suggestions

AUTUMN is the time to plant or transplant many of the wild flowers, whether they are dug from the wild or bought from growers. Those who set out to do this are urged to read carefully the accompanying articles on the cultivation of wild plants, so that they may profit by the experience of others: that they may have greater success, and may succeed in increasing rather than diminishing our native flora.

It should be clearly understood that the picking of wild flowers by individuals is by no means the only cause of their becoming scarce. The real causes of their disappearance are of 3 kinds: (1) large-scale draining of swamps, cutting of timber, overgrazing, and building of homes, factories, roads, etc., which are part of the advance of civilization; (2) forest fires, which, for the most part, are

preventable, and are often started by careless passers-by (throwing cigarettes from cars, etc.); (3) wholesale collecting of wild plants by dealers of various kinds. Similarly, refraining from the picking of wild flowers by individuals is not the chief remedy for the situation. It is merely one little thing that every person can do. The real remedy is not only to refrain from destroying the rarer wild plants, but to take active steps to bring about their increase.

The following lists have been supplied, in part, through the courtesy of the New England Wild Flower Preservation Society, 300 Massachusetts Avenue, Boston, Massachusetts. They will be of interest to all who seek wild flowers, for whatever purpose—whether only to study and enjoy them in the wild, or to plan a succession of bloom in their gardens.

1. Wild flowers which may be picked freely:

MAY

- Buttercup, *Ranunculus*, various situations
- Coltsfoot, *Tussilago Farfara*, waste places
- Yellow rocket or winter-cress, *Barbera vulgaris*, moist places

JUNE

- Blackberry, *Rubus*, mostly dry places
- Blueberry, *Vaccinium*, dry or swampy places
- Daisy, *Chrysanthemum Leucanthemum* var. *pinnatifidum*, fields
- Dandelion, *Taraxacum*, fields
- Dogbane, *Apocynum androsaemifolium*, thickets
- Yellow wood-sorrel, *Oxalis corniculata*, roadsides and cultivated soil

JULY

- Agrimony, *Agrimonia*, woods, thickets
- Bedstraw, *Galium*, edge of woods
- Bindweed, *Convolvulus*, fields, waste places
- Cat-tail, *Typha*, marshes
- Elderberry, *Sambucus canadensis*, roadsides
- Evening-primrose, *Oenothera biennis*, fields
- Ragwort, *Senecio*, wet meadows

AUGUST

- Aster, *Aster*, fields or woods
- Black-eyed Susan, *Rudbeckia hirta*, fields
- Butter-and-eggs, *Linaria vulgaris*, waste places
- Celandine, *Chelidonium majus*, waste places

Cinquefoil, *Potentilla*, meadows
 Clover, *Trifolium*, fields
 Coneflower, *Rudbeckia*, fields
 Joe-Pye weed, *Eupatorium purpureum*,
 moist or dry ground
 Meadow-rue, *Thalictrum*, wet meadows
 Milkweed, *Asclepias syriaca*, rich
 ground
 Mint, *Mentha*, moist soil
 Pickerel-weed, *Pontederia cordata*,
 ponds
 Spikenard, *Aralia racemosa*, rich woods
 Tick trefoil, *Desmodium*, dry woods
 Vetch, *Vicia*, thickets
 Wild cherry, *Prunus serotina*, woods

Ragwort



SEPTEMBER

Boneset, *Eupatorium perfoliatum*, low
 ground
 Bouncing Bet, *Saponaria officinalis*,
 waste places
 Bush clover, *Lespedeza*, sandy soil
 Elecampane, *Inula Helenium*, roadsides
 and damp pastures
 Everlasting, *Gnaphalium polycephalum*,
 fields
 Fleabane, *Erigeron*, waste places
 Goldenrod, *Solidago*, open places
 Hawkweed, *Hieracium*, fields
 Heal-all, *Prunella vulgaris*, woods and
 fields
 Ironweed, *Vernonia noveboracensis*,
 low meadows
 Jewel-weed, *Impatiens*, damp, rich soil
 Knotweed, *Polygonum*, waysides
 Loosestrife, yellow, *Lysimachia*, moist
 places
 Morning-glory, *Ipomoea*, dry soil
 Mullein, *Verbascum*, dry fields
 Partridge-pea, *Cassia Chamaecrista*,
 dry soil
 Pokeweed, *Phytolacca decandra*, rich
 soil
 Queen Annes lace, *Daucus Carota*,
 fields and waste places
 St. Johnswort, *Hypericum*, various
 situations
 Silverrod, *Solidago bicolor*, dry soil
 Sneezeweed, *Helenium*, wet meadows
 Spurge, *Emphorbia*, waste places
 Steeplebush, *Spiraea tomentosa*, road
 sides
 Stitchwort, *Stellaria*, wet meadows
 Tansy, *Tanacetum vulgare*, waste
 places
 Vervain, *Verbena*, waste places
 Vipers-bugloss, *Echium vulgare*, road
 sides
 Wild lettuce, *Lactuca*, roadsides or
 thickets
 Wild parsnip, *Pastinaca sativa*, rich
 waste land

OCTOBER

Golden aster, *Chrysopsis*, sandy places
 Thistle, *Cirsium*, waste places
 Yarrow, *Achillea Millefolium*, way
 sides



Courtesy of Wild Flower Preservation Society, Inc.
May-apple

2. Wild flowers which may be picked in moderation but not uprooted:

MARCH-MAY

Spring beauty, *Claytonia virginica*,
open moist woods

Flax, *Linum usitatissimum* (September), waste places

APRIL-MAY

False miterwort, *Tiarella cordifolia*,
woods

Butterfly-weed

Wood anemone, *Anemone quinquefolia*,
edge of woods

MAY-JUNE

Black-haw, *Viburnum prunifolium*, dry
ground

Blue flag, *Iris versicolor* (July),
swamps

Indian cucumber-root, *Medeola virginiana*, rich damp woods

Labrador-tea, *Ledum groenlandicum*,
bogs and damp thickets

May-apple, *Podophyllum peltatum*, rich
woods

New Jersey tea, *Ceanothus americanus*
(July), open woods

Star-of-Bethlehem, *Ornithogalum umbellatum*, meadows



JUNE-JULY

Butterfly-weed, *Asclepias tuberosa*, dry
fields

Button-bush, *Cephaelanthus occidentalis*
(August), swamps

JULY-AUGUST

- Arrowhead, *Sagittaria latifolia* (September), fresh water
- Closed gentian, *Gentiana Andrewsii*, rich woods
- Milkwort, *Polygala polygama*, dry open places
- Purple loosestrife, *Lythrum Salicaria*, marshes
- Skullcap, *Scutellaria lateriflora*, damp shade
- Swamp milkweed, *Asclepias incarnata*, swamps
- Sweet pepperbush, *Clethra alnifolia*, wet places
- Turtle-head, *Chelone glabra*, wet banks
- White snakeroot, *Eupatorium urticaceum*, rich woods

SEPTEMBER-OCTOBER

- Bayberry, *Myrica carolinensis*, sandy soil
- Purple gerardia, *Gerardia purpurea*, moist sandy soil

3. Wild flowers which should not be picked nor uprooted:

MARCH-MAY

- Liverleaf, *Hepatica triloba*, woods
- Virginia bluebells, *Mertensia virginica*, wet meadows

APRIL-MAY

- Bloodroot, *Sanguinaria canadensis*, woods
- Columbine, *Aquilegia canadensis*, open woods
- Dutchmans-breeches, *Dicentra cucullaria*, rich woods
- Trailing arbutus, *Epigaea repens*, dry woods

MAY-JUNE

- Arethusa, *Arethusa bulbosa*, bogs
- Bay magnolia or sweet bay, *Magnolia virginiana*, swamps
- Bunchberry, *Cornus canadensis*, damp, cold woods
- Creeping snowberry, *Chiogea hispidula*, cool, damp woods



Courtesy of Wild Flower Preservation Society, c.

Closed Gentian

- Dogwood, *Cornus florida*, dry woods
- Fringed polygala, *Polygala paucifolia*, damp woods
- Jack-in-the-pulpit, *Arisaema triphyllum*, moist woods
- Lady-slipper, *Cypripedium*, damp and dry woods
- Partridge-berry, *Mitchella repens*, woods
- Pinxter-flower, *Rhododendron nudiflorum*, open woods and swamps
- Pitcher-plant, *Sarracenia purpurea*, bogs
- Rhodora, *Rhododendron canadense*, cool bogs
- Showy orchis, *Orechis spectabilis*, rich, moist woods
- Trillium, *Trillium*, rich woods

JUNE-JULY

- Grass-pink, *Calopogon pulchellus*, bogs
- Indian pipe, *Monotropa uniflora* (August), moist woods

Meadow lily, *Lilium canadense*, moist meadows

Shinleaf, *Pyrola elliptica*, moist woods
Snakemouth, *Pogonia ophioglossoides*, bogs

Spotted wintergreen, *Chimaphila maculata*, woods

JULY-AUGUST

Fringed orchis, *Habenaria*, moist places

One-flowered pyrola, *Moneses uniflora*, woods

Rattlesnake plantain, *Epipactis pubescens*, dry woods

Rose-mallow, *Hibiscus Moscheutos*, marshes near coast

Sabatia, *Sabatia*, marshes

Turks-cap lily, *Lilium superbum*, wet meadows

Twin-flower, *Linnaea borealis*, moist woods and cold bogs



Showy Orchis

AUGUST-SEPTEMBER

Cardinal-flower, *Lobelia cardinalis*, low, moist ground

SEPTEMBER-OCTOBER

Fringed gentian, *Gentiana crinita*, low ground



All trailing ground evergreens.

Conservation Hints

Put out all matches, cigarettes, and camp fires.

Find out and tell others which plants must be conserved. Buy these plants or their flowers only from those who raise them.

When picking flowers which are not very common, gather only a few of the blossoms from each plant; leave the rest to produce seeds. Use scissors, knife, or clippers to cut neatly; do not break the plants by hand, and do not pull up the roots.

DO NOT THROW CIGARETTES FROM CARS



CALOCHORTUS

*Globe-tulips, Star-tulips, and
Mariposa-tulips*

Elmer C. Purdy

In all the world there is no more beautiful or more varied group of bulbous flowers than the genus *Calochortus*. The greatest number of different kinds may be found in the wild in California, Oregon, and Washington. Two grow as far east as the Dakotas; perhaps 8 in the semi-arid parts of Utah, Nevada, and Arizona; and 2 in Mexico. I will mention only those which are currently available to gardeners.

Star-tulip

Courtesy of Wild Flower Preservation Society, Inc.



Globe- and Star-Tulips

Globe- and star-tulips are native in open woodland or under open "chaparral" (the Spanish name for a mixture of deciduous and evergreen native shrubs) prevailing on many of our western mountain slopes. They are found in a variety of perfectly drained soils, gritty clay loam, sandy loam, and often on cool north slopes in gravelly soil that seems almost entirely devoid of nourishment, sometimes wedged in crevices of rocky ledges.

In gardens they will do well in full sun but the finest specimens are obtained in light shade with only filtered sunlight the blossoms are far more lasting if the plants are grown in the shade. They will grow in a wide range of soils, but the soil must be perfectly drained. Some finely divided humus is beneficial but not necessary. Animal manures should not come in contact with the bulb, but well-rotted manure placed an inch below the bulb and separated from it by clean soil or sandy loam will greatly improve results.

Throughout the West the summers are rainless and the soil becomes bone-dry after mid-June. Therefore *Calochortus* seeds ripen soon after flowering, and in nature the bulbs have a complete summer rest. Globe-tulips and star-tulips seem to stand a small amount of summer moisture without serious injury, yet they are better completely dry.

A globe-tulip has a single broad lance-shaped dark green shining leaf. The flowers are borne on branched stems and there are seldom fewer than 5 to 10 flowers; as many as 150 have been counted on a single stem. The golden globe-tulip, *Calochortus amabilis*, has rich yellow flowers, globular in shape, the tips of petals incurving like the pinwheel of our childhood; it may be from 6 to 10

inches high. *Calochortus albus* is usually 12 inches tall, but I have often seen it 18 inches to 2 feet; the globe-shaped flowers are pearly white. The purple globe-tulip, *Calochortus amoenus*, is of the same form but rarely over 8 inches tall and a lovely rose-pink in color.

Star-tulips are mostly dainty little woodland plants. Those mentioned (with one exception) have flowers that are upward-facing stars densely lined with silky hairs, for which children often call them "pussy-ears." The yellow star-tulip, *Calochortus Benthamii*, is a deep yellow star densely filled with yellow hairs, and with a dark spot at the base of each petal. Like it in form is *Calochortus Marceauanus*, which is to be had in 3 quite distinct varieties. *Calochortus Marceauanus major* is large, white with soft lavender hairs, and with a soft maroon-purple zone at center of cup. *Calochortus Marceauanus rosaceus* is of slender habit, and a soft lilac-pink. *Calochortus Marceauanus purpurascens* is quite distinct, the outer half of flower white tinted lilac, and the center of cup deep violet-purple.

Calochortus lilacinus, quite unlike the others of this group, has an open cup of soft lilac less densely filled with silky lilac hairs, and is very fragrant. It is not a woodland plant, but is native of open meadows which are moist until after flowering time. Soils are often pretty heavy, although it grows splendidly in light gritty clay loam, and equally well in moist sandy soils. It is very hardy, and there are reports of its increasing by offset and by seed to form nice colonies in several localities in New England.

Mariposa-tulips

True Mariposa-tulips are also called Mariposa-lilies and butterfly-tulips. They are found throughout California in valleys, on slopes, and in open spots among woods, usually in full sun and almost universally in a clay soil of very poor quality. Originally they abounded in all open lands; but grazing, cultivation of lands, and other inroads of civilization now

limit them to little odd corners of fields, and to areas where there is little grazing in winter and early spring.

For the successful naturalizing of Mariposa-tulips soils should be heavy, yet well drained. Heavy winter rains along the west coast give an abundance of moisture during winter and usually through flowering time in early June. From then on the ground is extremely dry, and the bulbs have a complete summer rest. That summer rest is absolutely essential for the perpetuation of the bulb. The Mariposa-tulip will endure no summer moisture whatever, whether it be in California, Ohio, or New Jersey. I have seen a long mountain slope with literally millions of flowers one year and not a flower to be seen the next. There had been a dry early spring forcing the bulbs into premature bloom and ripening; and with the seed almost ripe, a mid-June rain came and killed nearly every bulb on the slope. Mariposa-tulips should have ample moisture throughout the growing and flowering season until the petals drop; then dry off immediately. In regions where there are summer rains, or in western gardens where plants about them must be watered, the only recourse is to dig the bulbs as soon as seed pods are ripe and store them for replanting in October.

While Mariposa-tulips are usually found in full sun, they do equally well in light shade, and in such a situation produce longer stems and larger flowers, and last far longer. They are equally fine against a background of shrubbery.

If drainage is perfect the exact character of the soil is unimportant. The plants grow in the poorest of soil and in gritty loam, a sandy loam, or a clay loam. One very successfull amateur has for years used equal parts clay and sharp sand. While rich soils will sometimes produce splendid specimens, they are not to be recommended. Disease is likely to attack the plants badly in rich soils where growth is lush. If nothing but rich soil is available the bulb should be surrounded with 3/4 inch of sharp sand.

Of true Mariposa-tulips unfortunately only a limited number of species is available to gardeners at present, but those available are among the very loveliest.

There are in California two closely related species which have endless local color forms and markings. Botanically they are *Calochortus luteus* and *Calochortus venustus*; but horticulturally they have all been classed as *Calochortus venustus* for 3/4 of a century and will be found in catalogs under that name. *Calochortus venustus oculatus* is basically white but tinted purple in widely varying degree. Backs of petals are often a deep purple, yet may be soft rose or lilac. There is a rich maroon spot or eye in the middle of each petal. *Calochortus venustus citrinus* is a lemon-yellow counterpart with the back of petals often assuming a rich bronzy tint; its usual height is 18 inches. *Calochortus venustus* Eldorado grows to 2 feet and is more slender in habit; its flowers have longer and narrower petals. In color it offers endless variation of tints and markings; rarely are two plants alike; they may be lilac to purple, pink to claret, although white predominates. This variety grows best in a sandy soil free of humus. In heavy soils bulbs should be surrounded with sand.

Calochortus Vesta is a quite distinct species. The branched stems are seldom less than 18 inches high, and in favorable situations it is not unusual to see them standing 24 to 30 inches tall. The species has no uniform color, but presents an endless variety of colors and markings. The huge flower is an open cup 3 to 4 inches across; and stems may bear from a few to 15 or 20 flowers. The basic color is white and may be tinted or flushed lilac or rose in varying degree. Across the base of each petal is a blotch of richest golden brown which varies from a clear-cut spot to a broad zone. Not only is this species the largest and most showy, but also it is the most adaptable to cultivation, and the least affected by adverse conditions.

"Mariposa" is the Spanish word for butterfly. When the early Spanish settlers arrived in California and found the fields abounding in the group of *Calochortus* just described, they were reminded of the butterfly by the rich blotchings and markings of the flowers; and they aptly called them "La Tulipa Mariposa." It is only to this group that the colorful name "Mariposa-tulip" is correctly applied.

In the semiarid regions mentioned at the beginning of this article, there is another type of *Calochortus* of the same general form; and the name Mariposa-tulip has been extended to it also, although all of this type lack the distinctive butterfly markings. These rare desert species are lovely beyond words, but bulbs are rarely obtainable. They are for the amateur only if he is prepared to meet their very strict requirements.

Culture of *Calochortus*

General cultural requirements are identical for all groups. Bulbs of all are comparatively small, 3/16 to 5/8 inch in diameter. Space the bulbs 2 to 4 inches apart, and plant with 2 to 3 inches of soil over tip of bulb—3 inches in light soils.

Lift bulbs as soon as seeds ripen after flowering. Air them in the shade until they are quite dry, and store them in paper bags for replanting in October. As previously stated, globe- and star-tulips will endure some summer moisture, but digging and storing is recommended. Always dig and store Mariposa-tulips.

All do splendidly in pots. When only a few are to be planted in the garden potting the bulbs and sinking the pots into the garden in October to remain through flowering, then lifting pots and storing dry until the next October, is very much simpler than digging and replanting each year.

Time of planting: Bulbs are on dealers' shelves from September to December. They are packed dry and will keep perfectly. In all cold regions the bulb

should be planted just after heavy frost comes. This avoids any danger of premature starting which may occur with September planting.

Protection: The most successful growers in cold regions use no protection; they plant late; the plants come up as growing weather arrives in spring, hard and sturdy and in condition to resist late frosts. If a mulch is used, remove it at the earliest possible date in spring. Usually growth will have started under the mulch, and will be soft and tender and sensitive to even light frost. I recommend using no protection. Under deciduous trees or shrubs rake off any mat of leaves that may be over the *Calochortus* plantings. The tender shoots can-

not push through a litter of leaves or a mulch.

Calochortus bulbs are reputedly short-lived, and this is probably true under ordinary handling. They are a treat to field mice in the East and to gophers in the West; and many are lost to these animals. Where these pests cannot be controlled, protection by planting in wire baskets, pots, or boxes is advisable. If bulbs are dug after ripening and replanted in October they are not necessarily short-lived; their life span depends upon how they are treated.

I assure you that you will be well repaid for all the care you give *Calochortus* bulbs by your enjoyment of their lovely bloom.

Mariposa-tulip

Minnie May Johnson photo



A CITY WILD FLOWER GARDEN

In the Brooklyn Botanic Garden

Henry K. Svenson

AGARDEN comprising only the native plants of the local surrounding area, almost anywhere in the United States, is much more interesting than the heterogeneous so-called wild gardens found here and there, which often contain, in a helter-skelter fashion, plants from Maine to Oregon.

Such a *local* wild garden is the one at the Brooklyn Botanic Garden, in which are included only those plants which grow wild within approximately 100 miles of New York City. This garden should be

a source of encouragement to anyone who wishes to have a wild garden, for it was started under the worst possible conditions. The native trees of the area had been cut off about 150 years before; the last of the other native plants, and even the soil in which they grew, had long since been destroyed. These had been replaced, first by ashes and tin cans, later by garden soil planted mostly with foreign trees and shrubs.

The number of kinds of native plants that can be grown in ordinary garden soil is limited. Most wild plants will not thrive, or even continue to exist, in so artificial a medium; they require a situation like their native habitats—forest humus, sand, bog, unusual drainage, etc.

Sand Barren and Pond





Bog-laurel

What are the soil conditions necessary for the different plants? What are the conditions of temperature and moisture under which they grow in the wild? How can all these conditions be duplicated? Why do some wild plants refuse to grow under what appear to be the best of conditions? These are important questions in connection with growing wild plants. Some of them might be answered through study of such hard-to-grow plants as trailing arbutus, club-mosses, certain gentians and polygalas, and most of our wild orchids. The field of research here is unlimited, and very little has been done.

Aside from removing the foreign trees and shrubs, the main work in developing this wild garden, and the basis of its success, has been the bringing in of peat, sand, and various types of rock to provide for the different habitats. In fact the greater part of the work lies underground, for if adequate soils are once established, the native plants of the various habitats will usually maintain themselves. A thing

to be avoided is the use of fertilizers, especially manures, which tend to bring in weed seeds and earthworms. Much of the upkeep in the project consists in pulling out such weeds as Japanese knotweed (*Polygonum longisetum*), European grasses, sorrel, galinsoga, etc.; and a few aggressive native plants such as the tall and the rough goldenrods (*Solidago altissima* and *rugosa*), the blue wood aster and the heath aster (*Aster cordifolius* and *cricoides*) and pokeweed. Among woody plants ailanthus, sycamore maple, and the native Hercules-club become a nuisance.

This garden is laid out to represent 8 different kinds of habitats: a bog, a pond, a sand barren, a forest, a meadow, a serpentine barren, a plains area, and a limestone area. In this way, plants of widely different situations are shown in natural settings in miniature. Perhaps the region within 100 miles of New York City provides more variety in climate and peculiar soil environments than other similar areas, but every region has variations in plant habitats.

Many people who cannot bear the work and expense of building 8 different habitats on an ash heap may find that they already have situations suitable for one or two, without a great deal of alteration.

Bog

In the New York region, bogs occur either about ponds in the glaciated area, in which case they are frequently inhabited by black spruce and larch; or in the pine barrens of New Jersey, south of the glaciated area, where the swamp cedar (*Chamaecyparis thyoides*) is the representative tree. The bog in the Brooklyn Botanic Garden functions for both areas, hence it has these trees of both northern and southern range. One of the characteristic bog plants of both regions is the pitcher-plant (*Sarracenia purpurea*). With it grow readily the white-flowered sundews (*Drosera rotundifolia* and *longifolia*), and the purple-flowered sundew (*Drosera filiformis*) which is abundant in the pine barrens. Two orchids, the

grass-pink (*Calopogon pulchellus*) and the snakemouth (*Pogonia ophioglossoides*), take readily to our bog; the other native orchids seem too difficult for our conditions. Rhodora (*Rhododendron canadense*) and the early-flowering bog-laurel (*Kalmia polifolia*), the handsome swamp-pink (*Helonias bullata*), a pink-flowered member of the lily family with bright blue stamens, the fly-poison (*Amianthium muscaetoxicum*), still growing in a single locality on Long Island, and the related and even more striking *Zygadenus leimanthoides*, all do well in the bog and its borders. The pine-barren turkey-beard (*Xerophyllum asphodeloides*), a close relative of the "bear-grass" of the Northwest, flowers in occasional years. Adjacent to the bog the blazing star (*Chamaelirium luteum*) grows splendidly. I have seen a number of species of these lily-family plants grown in European rock gardens, and have often wondered why they were not grown more extensively in this country. Toward midsummer the bog tends to fill up with purple-flowered meadow-beauty (*Rhexia virginica*), our only genus representing the large tropical family of Melastomaceae.

A word about the construction of our bog. It is a concrete basin of irregular shape, about 18 inches deep. Built originally in 1912, it was renovated in 1931, and the concrete covered by a thin layer of asphalt. Ordinary baled peat moss fills the bog completely. There is an inlet for water, and the plants thrive without the use of acidifying chemicals.

Wild Pink



Pond

A shallow pond was constructed with clay bottom and sandy shores. It is drained in winter. In this pond we grow successfully golden-club (*Oreoutium aquaticum*), native species of arrowhead (*Sagittaria*), and the pickerel-weed (*Pontederia*); and on its borders the yellow-flowered St. Johnswort (*Hypericum ascyron*), loosestrife (*Lysimachia terrestris*),

restris), and *Steironema lanceolatum*. The pink-flowered tickseed (*Corcopsis rosea*) and hedge-nettle (*Stachys hyssopifolia*) are also very ornamental. Such a sand-rimmed pond is characteristic of the kettle-hole ponds in the glaciated area of Cape Cod and Long Island. A pond of this sort is very easy to make and operate, but care must be taken that bulrushes (*Scirpus* species) do not get a foothold. The pond is bordered on the far side by a thicket of blueberry, scrub oaks, bayberry, and groundsel-bush (*Baccharis*).

Sand Barren

This is probably the most spectacular and most successful element of our wild garden. It lies adjacent to the pond and is bordered by pitch pines (*Pinus rigida*) with an undergrowth of sweet-fern (*Myrica asplenifolia*) and beach plum (*Prunus maritima*). The sand is approximately a foot deep. Originally white sand was brought in from the pine barrens, but it was found that quartz sand purchased from local dealers was just as satisfactory. No shrubs are in the open barren except the trailing bearberry (*Arctostaphylos Uva-ursi*) and the somewhat similar broom crowberry (*Corcma Conradii*). Mats of pine-barren sandwort (*Arenaria caroliniana*) remain green throughout the winter, and have white flowers in early summer. Mingled with these are the wild pink (*Silene pennsylvanica*), the yellow clumps of *Hudsonia ericoides*, and the wondrously variable ipecac spurge (*Euphorbia Ipecacuanhae*). Later in the season the blazing star (*Liatris squarrosa*), goats-rue (*Tephrosia*), and the partridge-pea (*Cassia Chamaecrista*) enliven the white sand with color.

Alleghenian Forest

Nearly half of the garden is taken up by a forest of white, black, and scarlet oaks intermingled with beech, red and sugar maples, black birch, and hornbeams.

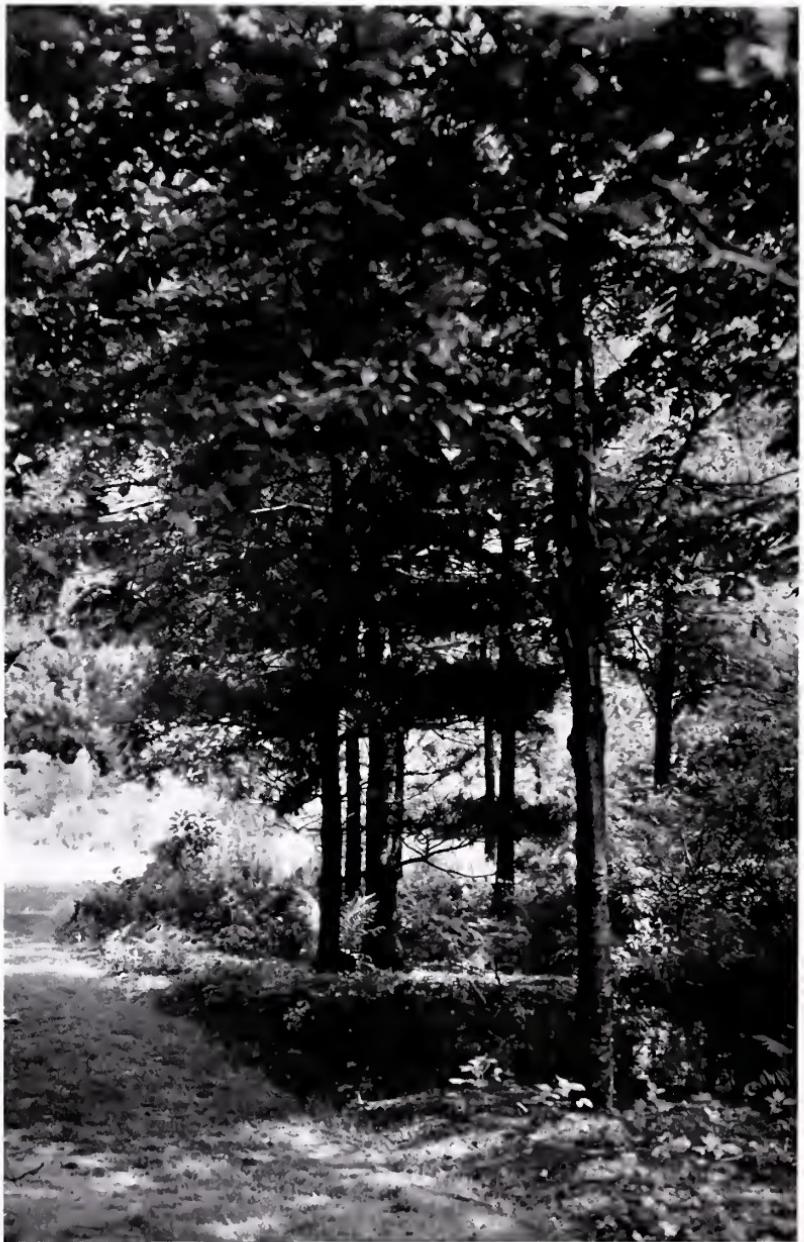
Most of these trees were planted in 1918. As buds burst on the trees in the spring, the best growth of herbaceous plants is seen on the forest floor. Some of these plants are bloodroot, wild ginger, spring beauty, white trillium, bellworts (*Uvularia* and *Oakesia*), and *Mertensia virginica*. The wild lily-of-the-valley (*Mianthemum*) forms carpets beneath the trees. The native bleeding-heart (*Dicentra eximia*) continues in flower through the middle of the season, and is perhaps the most successful of all. When trees have leafed out fully there are no more herbaceous flowers until asters appear in the fall.

Meadow

The brook, after running through the woodland, drains into a small open meadow. This meadow has a succession of bloom from early spring—marsh-mari-gold, golden ragwort (*Senecio aureus*), globe-flower (*Trollius*), and bluets—through summer, when the meadow lily (*Lilium canadense*), *Anemone canadensis*, cardinal-flower, and rose-mallow (*Hibiscus Moscheutos*) are in flower. In the autumn the meadow supports a fine growth of goldenrod and asters.

Serpentine Barren

Much of Staten Island is underlaid by a greenish rock which is rich in magnesium. (This rock is called "serpentine" because it often has a spotted or mottled appearance, resembling a snake's skin.) Similar and more extensive areas lie west of Philadelphia; from some of these come originally the moss-pink (*Phlox subulata*), which has been cultivated in many variations of color. A peculiar variety of the native field mouse-ear chickweed, with unusually large flowers, was brought to the garden from these barrens, together with other species more or less confined to the serpentine habitat. Rock brought from Staten Island provides a home for these plants, as well as the Scotch bluebell



Woodland in the City

(*Campanula rotundifolia*), known also from the palisades of the Hudson River, rock-cress (*Arabis lyrata*), and the shooting-star (*Dodecatheon*).

Plains Area

One of the most unique habitats near New York is the prairie on western Long Island, known as the "Hempstead Plains." Most of these plains have now been destroyed by encroachment of the city, but a truck-load of sod from one of the best remaining areas was brought to the garden a few years ago. Large areas of these treeless plains were blue in the spring with the bird-foot violet (*Viola pedata*). Later the white spikes of colic-root (*Aletris*), various species of rockrose (*Helianthemum*), goats-rue (*Tephrosia*), and pink milkwort (*Polygala polygama*), give conspicuous color to the Plains. We have not succeeded in growing the polygala.

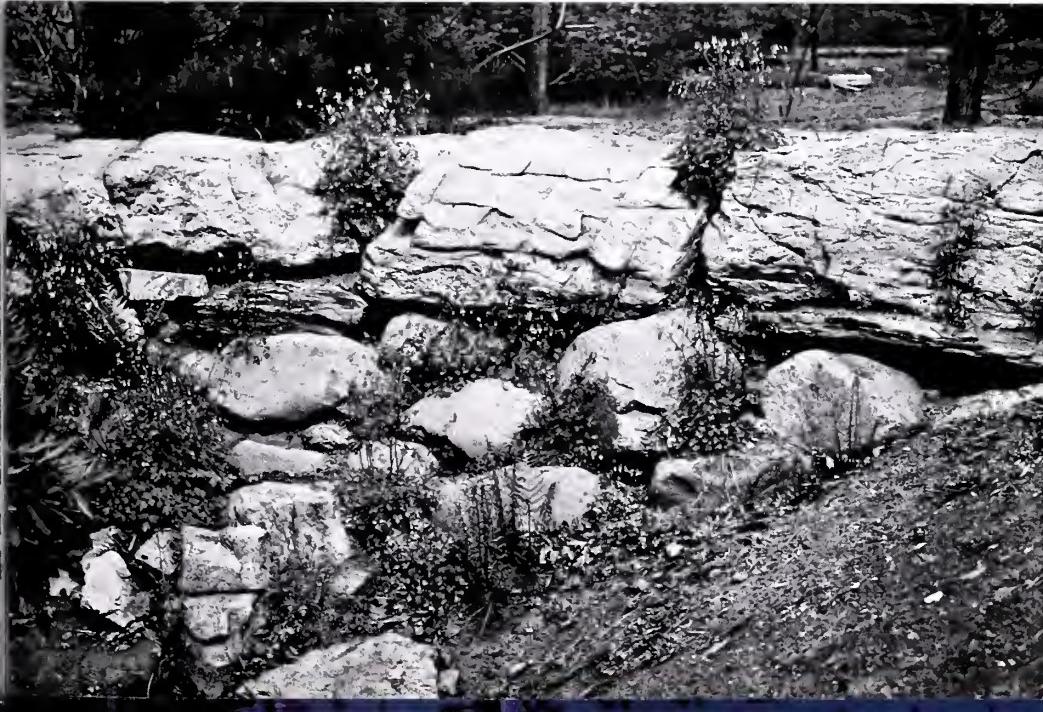
Limestone Area

The last ecological replica to be set up is based on limestone brought from western New Jersey. The rock wall harbors certain kinds of ferns, such as the cliff-brakes (*Pellaea atropurpurea* and *Pellaea glabella*), maidenhair spleenwort, and wall-rue. The flattened limestone allows growth of *Hepatica acutiloba*, rue-anemone, yellow lady-slipper, bristly buttercup (*Ranunculus hispidus*), and a large number of other species.

In the small area of our wild garden it is possible to see, in less than an hour, plants which it would take more than a week to locate in the New York area. With the continued expansion of the city, cutting of forests, and drainage of swamps, many beautiful and interesting native plants are destined to disappear entirely. Perhaps such areas as we maintain in the Brooklyn Botanic Garden will be their last refuge.



Rock Ledge with Columbine



AMERICAN DAFFODIL SELECTIONS

What Kinds are Needed, What Kinds are Available, and Why

Jan de Graaff

IT would be an interesting study to find out just when daffodils reached our country, which varieties the pioneer settlers brought over, and which of them could still be found in old gardens and plantations. But even without going into this subject too deeply, by studying some of the older varieties surviving in the large naturalized plantings in the South, we can reach some interesting conclusions. The first and most important of these is that without doubt these old varieties of daffodils have an endurance, a strength to live under severe conditions, that most of the newer hybrids lack. This brings up a very interesting question: in the process of breeding better daffodils has too much emphasis been placed on perfection of form and on size, to the detriment of generally good garden qualities?

Old Species Types

To answer this question we must consider varieties that make up the old daffodil plantings. We find that there are several distinct types. One is a group of trumpet daffodils, ranging from uniform yellow through the paler bicolor shades to a pure white; another consists of various forms of *Narcissus poeticus*; and a third, a group of small polyanthus types such as *N. biflorus*. If we add to these the single and double true *N. Jonquilla* (jonquils) we have covered the field pretty well. All of these daffodils are still very close to the original species found in Spain and Portugal. While the trumpet daffodils are larger than *N.*

minor and *N. bicolor*, they are no larger than Golden Spur which in itself is probably just a garden variant of one of the native daffodils of Spain.

All these daffodils have one thing in common: they seem to be endowed with stamina, with a strength that enables them to live under the strongest competition of other plants, including weeds and grasses. Year after year their flowers burst forth; they multiply and persist in spite of complete neglect: in fact, they seem to thrive under this kind of treatment. These daffodils were introduced, by our early settlers, from England; they had reached that country from Spain, where they had been collected in the mountain regions. There is no doubt that in their natural habitat, through a process of survival of the fittest, they were able to withstand the competition of strong native vegetation. Likewise in England they were grown in woodlands and hedge-rows, and in cottage gardens which were often neglected. It seems reasonable to assume that the pioneers brought with them the strongest-growing kinds and the biggest bulbs they could locate. Often repeated, this process of selection eliminated the weaker types. The daffodils that were brought to this country and that formed the foundation stocks of our naturalized plantings were still essentially close to the true species, but they were also the best of garden selections and variants.

Early Hybrids

While some crossing of daffodils had been done in England before the end of the 18th century, it was not until 1836 that Dean Herbert set himself to systematic hybridizing. At that time there existed some 150 different types, most of them natural hybrids or true species.

Other early hybridizers, such as Leeds, Horsefield, and William Backhouse, worked from 1850 on. Studying the varieties raised by these pioneer hybridizers we find that their crosses were made with flowers that were still close to the original species. These old daffodils, such as *N. Horsfieldii*, still retained the full vigor of their wild parents. *N. Horsfieldii* was the result of a cross between a fine form of the wild English Lent lily, *N. Pseudo-Narcissus*, which Horsefield found growing on the banks of a river, and the smaller *N. bicolor* which he had growing in his garden.

Later Hybrids

It was not until about 1870 that some of the larger hybrid daffodils became available, varieties such as Emperor, Empress, and Weardale Perfection. It is from approximately that time on that a divergence in garden qualities becomes noticeable between the old varieties and the newer hybrids. In the process of raising bigger and better daffodils some of the native strength had disappeared. The reasons for this disappearance are not far to seek. The potentiality of the daffodil for variation intrigued the early hybridizers. Types that were distinct in form and coloring from the older and well-known varieties were selected for further propagation and hybridization. Low-growing forms, varieties with short stems and comparatively small flowers, were discarded or overlooked. And it is these same low-growing types, as I will show later on, that make the ideal daffodil for naturalizing and for general garden purpose.

Edwards Leeds died in 1877, John Horsefield in 1854, and William Backhouse in 1869. Their work was largely carried on by Peter Barr, who had gradually acquired the collections of seedlings raised by them and by other hybridizers. Peter Barr sent a portion of this huge collection to S. A. de Graaff of Leiden, Holland; and both men continued the hybridizing work of the pioneer

growers. The first Daffodil Conference, held in 1884, created a great interest in the new daffodils and stimulated several amateur growers to emulate the work of Leeds and Backhouse by trying their hands at hybridizing. I cite these dates and names to make one point: that prior to 1880 the hybridizing was still done mainly with collected material, daffodils that had been found in the wild either as true native species, or as escapes from old gardens and then probably no more than garden variants from species imported many years ago from Spain and Portugal. After 1880 the work was done mainly with varieties that were already hybrids, selected for special qualities.

Since 1880 the emphasis of almost all breeders has been on show quality. The annual shows of the Royal Horticultural Society in London became the mecca of all daffodil lovers. Every hybridizer—the ranks were growing fast—tried to produce something different from the other. The emphasis on length of stem,

Trumpet Daffodil



refinement of form and color, and size, increased. Something else happened too. These new daffodils, undoubtedly far superior to the old kinds for the show table and for cut flowers, were most carefully raised in gardens and nurseries. The little seeds and seedlings received the maximum of care and attention. The bulbs were transplanted annually or biennially. They were nursed and sheltered to produce the finest possible flower. And again from these flowers, grown with such care, selections were made for further hybridization. This procedure, carried on from 1880 (approximately) to the present, provided a continual pro-

cess of selection that steered the new daffodils farther and farther away from the purpose for which most daffodils are destined, that is, to provide beauty and color in our gardens. Other factors contributed to this cleavage between daffodils suited to our American gardens and those suitable for showing at British daffodil shows.

The breeders who were most influential in guiding the destiny of our modern daffodils were people like Brodie of Brodie, Scotland; Guy L. Wilson and Lionel Richardson from Ireland; P. D. Williams, Mrs. R. O. Backhouse, and others from England; and the de Graaffs from Holland. All these breeders worked in a comparatively mild climate. They took further recourse to special shelters for their seedlings, growing them either in protected gardens or in cool greenhouses in the early stages of development. In a comparatively short time the daffodil developed, from the common and robust flower of the English cottage garden and woodland, into an almost exotic product that needed special conditions for its continued and perfect flowering.

Poets Narcissus



Varieties for American Gardens

If we consider these newer daffodils for our American gardens, and think in terms of varieties that will do well in all the varying soil and climatic conditions of the more temperate part of the United States, we find that there are still a good many new varieties that give a good accounting of themselves. Some of these, the new Jonquilla for instance, are obviously still so close to the species types that we can readily understand their strength. The same applies to the *N. cyclamineus* hybrids such as February Gold, the *N. triandrus* hybrids such as Thalia and Moonshine, and the *N. poeticus* varieties. But when we think of more complicated hybrids we find that there are also some that will do extraordinarily well under the most severe conditions. As an illustration, there is the white trumpet daffodil Beersheba.

This variety has shown an ability to withstand the severest winters, to stand spring snow storms and hot summers, yet it is as complicated and advanced a hybrid as almost anything that is being offered commercially today. I believe that there are two good reasons for the fine performance of Beersheba. One is that the stem is comparatively short, the other that the foliage is unusually broad and sturdy, giving protection to the plant and flower. A third reason is that, grown in this country, the stocks of Beersheba are remarkably free from virus diseases, and the bulbs therefore lack nothing in vigor.

Unfortunately there are very few data available on the behavior of other new varieties of daffodils in this country. In talking to informed amateurs and to dealer specialists in this country, however, I have repeatedly heard mention of a great number of other varieties of rather recent origin, that did well under severe conditions. Mr. Carl C. Krippendorf of Cincinnati, Ohio (a city which certainly does not enjoy an ideal climate for daffodils), has raised acres of fine daffodils in his gardens and lists many varieties that do extraordinarily well for him. Similarly in the Missouri Botanical Garden (in St. Louis) and in other locations there are fine collections of daffodils which have persisted for years and which still flower profusely each spring.* Yet, in looking through current catalogs, and in studying the variety selection now grown by commercial daffodil specialists in Holland, England, and this country, we find that many of these varieties, so well suited to our gardening needs, have disappeared.

The reasons for this disappearance are not so easy to explain. Like any other horticultural product, daffodils must pay

the grower if he is to continue raising them. Though varying in the producing regions, the cost of production is high. In Holland, which by virtue of its skilled labor, favorable climate, and the commercial ability of its growers, had practically monopolized the prewar bulb trade with this country, a definite minimum production cost can be set for daffodils. The Dutch grower will then select for propagation those varieties which by virtue of scarcity, demand, or novelty, command a better-than-average price. For he well knows that once a variety becomes plentiful, and the supply of it equals or exceeds the demand, the price for his finished product will sink dangerously low, often below his production cost. As a good grower he will also pay particular attention to the rate of propagation of his varieties. Slow-growing types, therefore, find little favor in his eyes; and unfortunately these are generally the very ones that are so well suited to naturalizing.

For purely economic reasons then the Holland growers were interested mainly in fast-growing, prolific daffodils for which a mass demand existed. Such varieties are those that can be forced easily in greenhouses and will flower there before the daffodils from outdoors come in. This market for forcing daffodils has always been much greater than the market for varieties that found their chief merit in garden plantings. The forcing quality of daffodil varieties has thus been a very great factor in the selections that were made.

The First World War, which effectively stopped the export of daffodils from Holland, contributed to the destruction of many varieties of proved garden merit. The announcement of quarantine 37 finally virtually excluded Holland from participation in the daffodil trade in this country and caused many more stocks to be discarded. The commercial plantings that were made in this country in the first place consisted of forcing varieties, for which a ready demand existed. Also,

* One of the largest single naturalized plantings of the variety Sir Watkin has thrived in the Brooklyn Botanic Garden for 20 years. Many thousands of blossoms brighten about half an acre of hillside in the Garden every spring.

several growers imported large collections of British and Dutch hybrid daffodils. But the high cost of importation, the risks connected with the enforced hot-water treatment, and the cost of production under the very strict quarantine regulations, restricted such importations to the very best and newest kinds. No grower could afford to stock up on old, though charming, garden varieties for which but a very limited market existed.

When we now look over the selection of varieties offered us by American and foreign growers and dealers, we find a plethora of fine forcing varieties such as King Alfred, and a good selection of fine novelties suited for cutting and for shows. Varieties for naturalizing, daffodils that can be planted out, and that will flower in spite of neglect and under any conditions, are scarce. The exceptions are those hybrids previously mentioned that are still close to the species of *Narcissus*, i.e., *Jonquilla*, *triandrus*, *cyclamineus*, and

poeticus, of which many splendid varieties are available.

From the foregoing it is clear that the variety selection of daffodils available today, is not fully adjusted to the needs of American gardens for good naturalizing material. It is equally clear, however, that neither the commercial growers nor the hybridizers in Europe or this country can fill this need without having at their disposal trial and testing ground in various sections of this country. Here is an obvious task for both the American amateur grower and the botanical gardens in various sections of this country. If all experience with daffodils from various parts of the country were carefully collected and compared, and these data were made available to our commercial growers, the first and most important step on the road toward a better variety selection for our gardens would have been taken.



Sir Watkin Daffodils in the Grass in the Brooklyn Botanic Garden



SOME HYBRIDS OF LILIUM WILLMOTTIAE

Their Superior Qualities, and the Encouraging Outlook

F. L. Skinner

DURING the first 20 years of the present century many lilies were introduced into cultivation from western

Lilium Willmottiae Hybrid

Author photo



China and Korea; and the advent of these has not only stimulated a great deal of interest in lily growing but has given plant breeders much new and interesting material to work with. Foremost among the species that have lent themselves to the breeder's art is *Lilium Willmottiae*. This fine lily is a handsome plant in its own right, with its beautifully formed recurved flowers gracefully borne in a pyramidal cluster; unfortunately it frequently has a stem too weak to hold erect the 30 or more flowers which a mature bulb bears on one stem.

In an endeavor to correct this fault and to secure new forms, breeders have been crossing this plant with a number of other species, with very encouraging results. Now hybrids of *L. Willmottiae*, many of them of the easiest culture, can be found with stiff stems that will grow up to 6 feet high and hold heads of 30 to 60 flowers erect without staking. The Maxwill lily (one of my raising) is one of the taller of these hybrids, that has taken kindly to cultivation not only on this continent but from Holland to New Zealand. Skyrocket (raised by Mr. R. Palmer of Summerland, B.C.) is one of the newer of these hybrids that is very promising as a garden plant.

Not only do these *L. Willmottiae* hybrids have stiff stems and well-formed flowers that may face outward or upward or hang gracefully pendant like *L. Willmottiae* itself, but they bring a wide range of color into this easily handled lily family. In the earlier hybrids the orange-red shades predominated; but now a goodly number of yellow, flame-red, and even blood-red varieties are appearing; and during the past summer another race of *L. Willmottiae* hybrids has appeared that brings in white and shades of cream and rose pink.

These new varieties in the white, cream, and pink shades are the result of combining *L. cernuum* (the pink Korean lily) with *L. Willmottiae* and some of its hybrids. This work has been done by Dr. Patterson of Saskatoon in an endeavor to add range of color to the lilies that can be grown without protection in the rigorous climate of Saskatchewan. These new lilies of Dr. Patterson's were only 3 years old last summer, and had not yet reached their full growth; yet some of them were over 3 feet high with beautifully reflexed pendant flowers and stout stiff stems, and gave promise of developing into specimens as beautiful in

form as the one figured. In many cases they had fragrance as an added attraction.

These developments with one small section of the lily family have all taken place within the past 20 years. What of the future? May we not reasonably expect to have hardy, easily grown garden lilies in as wide a range of color as the modern Gladiolus, and in much greater variety of form—lilies that will be quite suitable for cut flowers and that can be had in bloom from June to September without special care?

[Autumn is the time to plant lily bulbs.
Ed.]

Lilium Willmottiae (must be staked)

Author photo





N. Y. Herald Tribune photo

Mayor O'Dwyer of New York City and Health Commissioner Weinstein showing specimens of ragweed prepared at Brooklyn Botanic Garden. Boy Scouts with circulars

“OPERATION RAGWEED”

All-out War on Autumn Hay Fever

Philip Gorlin

FOR many years the New York City Health Department has been confronted with a problem affecting hundreds of thousands of its citizens. Almost nine out of every ten persons afflicted with late summer and autumn hay fever suffer from the air-borne pollen of the common and giant ragweeds growing profusely in vacant and neglected areas within the five boroughs. It causes great discomfort for a period of several weeks. For many years it was the popular notion that goldenrod was the principal cause of autumn hay fever. This was probably because its golden flowers were visible during the fall, while the flowers of the ragweeds blooming about the same time were inconspicuous. Goldenrods are of no importance in hay fever since most of them shed only small amounts of pollen,

and this pollen is sticky and too heavy to blow about; it is an insect-pollinated plant.

There are two kinds of ragweed. The common ragweed, *Ambrosia artemisiifolia*, has finely divided, hairy, fern-like leaves, and grows usually not more than 4 feet high. Male and female flowers are borne on the same plant, the male in clusters on slender spikes at the top, producing the toxic pollen, and the female flowers at the bases of the leaf stalks, producing the seeds. None of the flowers have petals. In the New York area they usually begin to bloom and shed pollen on August 10 to 15, regardless of the extent of their development: they may be 2 inches or 4 feet in height at the time of flowering. The giant ragweed, *Ambrosia trifida*, reaches 15 feet, with rough, broad, 3- or 5-lobed leaves, and flowers similar to those of the common ragweed, but appearing about a week earlier. The pollen of the two kinds is abundant enough to

New Yorkers!
RAGWEED CAUSES HAY FEVER
HELP DESTROY RAGWEED

Several hundred thousand New Yorkers suffer from hay fever.

Most of the cases of hay fever are caused by ragweed which discharges pollen into the air during August and September.

Ragweed can be destroyed by cutting, or spraying with a chemical known as 2,4-D. This chemical is inexpensive and effective.

2,4-D can be bought in stores selling garden supplies and in other general stores.

JOIN THE ALL-OUT WAR ON RAGWEED... LEARN TO RECOGNIZE RAGWEED... IF THE WEED GROWS ON YOUR PROPERTY, CUT IT OR SPRAY IT WITH 2,4-D.

Copy of Circular Distributed by
Boy Scouts

affect sensitive persons between August 15 and September 30.

Both the common and the giant ragweed are annuals and reproduce only by seeds. The most effective step in their control, therefore, is to prevent them from producing seed. This can be accomplished by cutting or mowing the weeds before they blossom, or by destroying them with herbicides. Pulling them disturbs the soil and uncovers dormant seeds which thus have an opportunity to germinate. It is desirable to destroy the weeds before they begin to bloom, that is, before August 1.

Attempts to enforce City laws requiring property owners to destroy ragweed and other noxious weeds growing on their land have proved ineffective and time consuming. Following a period of investigation, experimentation, and consultation with representatives of the Department of Health, Department of Parks, and Brooklyn Botanic Garden, it

was decided that ragweed could be controlled within the City by spraying all infested areas with herbicides containing 1/10 percent 2,4-D (2,4-dichlorophenoxyacetic acid), thoroughly wetting the foliage. Best results are obtained when spraying is done during June and July. But even if spraying operations are delayed until the ragweed comes into bloom, although the plants may not be killed, the flowering parts are so affected that practically no pollen is formed and no seeds are produced. This protects hay fever sufferers during the current season and reduces the number of possible ragweed plants the following year.

There are several commercial preparations containing 2,4-D found on the market under a variety of trade names offered by 30 to 40 manufacturers. There is a difference in price of the various preparations, since the content of the active ingredient may range from 9.6 to 85 percent. The sodium and ammonium salts of 2,4-D are readily soluble in water.

Caution must be exercised in the use of 2,4-D solutions. Soil which has been treated with this material either directly or when applied to weeds may impair germination of seeds for 2 or 3 months. 2,4-D spray should not be allowed to blow or drift to valuable shrubs, trees, vines, vegetables, or other desirable plants. In such locations the sprayer nozzle should be kept close to the weeds and turned away from the desirable plants.

When funds were finally made available for ragweed control the last week in July, no spraying equipment, chemicals or men were available. But the Sanitation Department offered street flushers and drivers, the Borough Presidents' Offices made available street oiling and chloride distributing equipment, and the U. S. Public Health Service contributed a mosquito control unit. The Department of Health procured 33,000 pounds of 2,4-D sodium and ammonium salt necessary equipment to convert the available pump units for spraying work, op-

erating and supervising personnel, and general financial support. The Police Department proceeded to locate and map ragweed-infested areas. The Brooklyn Botanic Garden and the New York Botanical Garden supplied valuable information and prepared mounted specimens of common and giant ragweed for the Police Precinct Headquarters, Borough President Offices and Health Department Borough Offices. Boy Scouts distributed circulars and posters urging land owners to destroy ragweed growing on their property by cutting or by spraying with 2-4-D. The New York Meteorological Observatory at Central Park and the Brooklyn Jewish Hospital continued the recording of the atmospheric ragweed pollen count daily during the pollen-producing season.

Health inspectors in all boroughs dispatched spraying crews to heavily infested ragweed areas as soon as equipment was converted. The Borough Presidents' Offices attacked growth on

public properties and sidewalks; the Department of Health sprayed the noxious weeds on privately owned vacant property; and the Department of Parks treated ragweed growing in areas within its jurisdiction, using standard tree spraying equipment. The spray solution was applied at the rate of approximately 300 gallons per acre. In the first 3 weeks of the campaign more than 800 acres of ragweed 2 to 12 feet tall were sprayed; about 2,400 pounds of 2-4-D sodium salt were used. Thirty-three spraying units were finally put into operation.

The selective action of 2-4-D will inhibit the growth of broadleaf weeds and encourage the growth of grasses. An intensive ragweed control campaign, when conducted on a community-wide basis for several successive seasons, and emulated by adjacent communities, will result in a material reduction in atmospheric pollen, and in relief to victims of pollen allergy.

Copy of Poster Distributed by Boy Scouts



Giant Ragweed



Common Ragweed

NEW YORKERS

RAGWEED CAUSES HAY FEVER

YOU CAN HELP

DESTROY RAGWEED

BY CUTTING OR SPRAYING

WEEDS ON YOUR PROPERTY

SPRAYS CONTAINING 2,4-D ARE MOST EFFECTIVE

**KEEP SPRAY AWAY FROM VEGETABLES,
SHRUBS, TREES OR OTHER DESIRABLE PLANTS**

The LAW requires owners to DESTROY RAGWEED

DEPARTMENT OF HEALTH
CITY OF NEW YORK

WILLIAM O'DWYER
Mayor



Homeward Bound

WITHIN THE BOTANIC GARDEN

HARVEST TIME IN THE CHILDREN'S GARDEN

The average city child cannot know much about the real meaning of the word "harvest." He cannot dream of thousands of acres of golden corn ripening in the sun, of combine harvesters and threshing machines, unless he has really experienced a harvest period on a farm. The city child who grows his own vegetables, however, has a very different conception of the word "harvest." To him it means ripe tomatoes, succulent cucumbers, long tapering carrots, and crisp radishes. The harvest period in the Children's Garden really began when the first radish was pulled, only a few weeks after the seed was sown. The string beans grew this year as if by magic, and produced pods 6 inches long, when the flowers had scarcely been noticed. The wise

children picked them early, while they were young and crisp; and those who left them longer, hoping they would grow larger, learned a lesson that they will certainly remember. Closely following the string beans, came the lettuce and young beets. Spinach and Swiss chard came in their turn, and when one crop was harvested another was sown.

The crop which was most carefully watched and guarded was the tomato. The plants were carefully pruned and securely tied to stout stakes. The younger children watched the yellow flowers turn into little green balls, and the little green balls turn into flaming red fruits, which they picked and weighed with an incredulous look in their eyes.

The children's reaction to the results of their efforts is very interesting. Some of them can hardly wait to pull their beets, or pick their spinach; and the crop is often in danger of being exterminated before it has had opportunity to develop. Others wait to get the maximum results, and in their eagerness to obtain size and quantity, sometimes sacrifice the quality of their crop. Then there is another group which seems to get all the fun out of the growing of the crop. They sow with caution, cultivate with care, and weed and hoe in a most conscientious manner; but when the crop is mature and ready to be harvested, up it comes and anyone may have it, so long as they can get on with the job of sowing the next crop.

The crop produced by 250 children on their 125 pint-size garden plots is certainly an achievement, but the harvest reaped in knowledge and understanding of the plant world is infinitely greater. Gardening with city children has been a summer practice at the Botanic Garden for the last 33 years, and consequently some thousands of young people have passed through the Garden in search of knowledge and recreation.

The wholesome comradeship of their partners and neighboring plot-holders breeds honest comment and criticism which is as good for the soul of a perpiring 10-year-old, as the equally generous praise bestowed upon the proud



Corn for Dinner

owner of a "blue stake" which is awarded each week for honest effort and good results.

ELIZABETH HESS

WORKING WITH PUBLIC OFFICIALS ON HAY FEVER CONTROL

"Ragweed must go!" declared New York City Board of Health Commissioner Weinstein. The pollen from this noxious weed causes intense suffering to hay fever victims.

In cooperation with the program of ragweed extermination, three members of the Garden staff prepared several dozen mounts of ragweed, so arranged that anyone could recognize the weed growing along city streets, in vacant lots,

or in back yards where it has, until now, been allowed to thrive. These mounts are being used to familiarize police officers and other City employees with the unwanted plant.

Earlier in the project, Garden scientists contributed information on killing ragweed with the new selective weed killer 2-4-D.

MICHALENA LE FRERE CARROLL

TESTING NAMELESS FLOWERS

Named and unnamed garden annuals have grown side by side in this year's annual flower trials at the Garden. Last spring seeds of a considerable number of nameless varieties were sent by the All American Flower Seed Selections Committee to be grown for comparison with named varieties, and thus make their bid toward being worthy of public introduction. Since these new annuals are as yet un-introduced and nameless, various trial grounds over the United States were selected to determine their garden value and usefulness. The Brooklyn Botanic Garden was one of these.

The judges for the annual trials have visited the Garden together with interested seedsmen, all of whom made their notes and gathered information on some of the varieties already on sale. Of the

new and as yet unnamed annuals, those which receive the greatest number of points from the judges will be given an award and later made available to the public. Some of the points the judges consider include flower color, habit of growth, freedom from disease, trueness to type, and general garden usefulness. One or two of the unnamed varieties show promise and perhaps will receive an award.

Among the relatively new named varieties that did well at the Botanic Garden this season are Petunia Salmon King, Petunia Peach Rose, Petunia Cheerful, Petunia All Double Rose Marie, Dianthus Westwood Beauty, Marigold Victory, and 5 or 6 color variations of Salvia Welwyn.

CONRAD B. LINK

RETIREMENT PLAN FOR GARDEN EMPLOYEES

In order to provide retirement income for its employees, the Garden started a Contributory Annuity Plan on July 1, 1945. The legal provisions were completed on June 7, 1946. Although many of the employees of the Garden receive all or part of their salaries from city funds, they are not eligible for membership in the City Retirement Plan.

Employees between the ages of 25 and 68 years may join the Plan on July 1 of the year following their completion of one year's service. After February 1, 1946, all new employees are required to join the Plan when they become eligible.

The Plan provides that each participant contribute 5 percent of his annual salary, which is matched by an equal contribu-

tion from the Garden. The funds are deposited with the Chemical Bank and Trust Company, 165 Broadway, New York, which has been designated as Trustee by the newly created Retirement Board.

At the present time participants are eligible for retirement upon reaching the age of 68 years. After July 1, 1952, however, the retirement age is lowered to 60 years for women, and to 65 years for men.

During the fiscal year 1945-1946, 31 employees contributed \$3,285.38 to the Retirement Fund and the Garden contributed an equal amount.

THOMAS A. DONNELLY



AMONG THE CONTRIBUTORS TO THIS ISSUE

JAN DE GRAAFF is a member of the great de Graaff family of Nordwyck, Holland, who came to this country about 25 years ago to establish the Oregon Bulb Farms at Sandy, Oregon.

PHILIP GORLIN is Health Inspector, Bureau of Sanitary Engineering, New York City Department of Health.

DR. MINNIE MAY JOHNSON, of Stephens College, Columbia, Mo., is a botanist greatly interested in wild flowers.

FREDERICK W. G. PECK is a Philadelphia landscape architect, who has just returned from army service.

ELMER C. PURDY is the son and successor of the famous Carl Purdy, wild flower grower of Ukiah, California.

HESTER M. RUSK is a member of the staff of the Botanic Garden.

F. L. SKINNER, of Dropmore, Manitoba, Canada, is a nurseryman and great breeder of lilies, lilacs, and other plants.

DR. HENRY K. SVENSON has been a member of the staff of the Botanic Garden since 1930, and has recently been appointed Curator of Forestry and Botany of the American Museum of Natural History.

KATHRYN S. (MRS. LUCIAN B.) TAYLOR, of Dover, Mass., is an amateur gardener greatly interested in wild flower growing.

ALBERT F. W. VICK, JR. is a commercial grower of wild flowers with a nursery at Glen Moore, Pa.

DR. EDGAR T. WHERRY is an ecologist in the Botanical Department of the University of Pennsylvania, long interested in preserving our native wild flowers; and in charge of wild flower work at Bowmans Hill, a Pennsylvania State Park on the Delaware River.



BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

Winter, 1946

Digests of
the Year's Highlights
in
Orticulture and Gardening
—1946—

—
Christmas Decorations
—

Guide to
Recent Non-technical
Books and Articles
about Plants



AUTHORS WHOSE ARTICLES APPEAR IN THIS ISSUE

ROBERT S. BIRD is a staff writer for the *New York Herald Tribune*. For his report on the Dutch elm disease he interviewed authorities in several States, including Connecticut, New Jersey, New York, and Massachusetts. He visited laboratories and experimental plots, and spent about ten days in research work before writing the article.

ELLEN B. CARDER (Mrs. Frederick C. H.) of West Cheshire, Conn., is a past Chairman of the Federated Garden Clubs of Connecticut, and has received their Bronze Medal for her work with primroses.

R. MILTON CARLETON is with the Chicago office of Vaughan's Seed Store; he is Manager of the downtown retail store.

DR. ARTHUR HARMOUNT GRAVES is a member of the staff of the Brooklyn Botanic Garden. For the past 16 years he has been hybridizing American and Oriental chestnut trees in order to develop a disease-resistant tree of timber to replace the American chestnut which has been killed off by the blight.

ALBERT G. HALL is Assistant Editor of the American Forestry Association's publication *American Forests*.

LEO HIRTL is a reporter for the *Cincinnati (Ohio) Post*.

ELIZABETH B. MERRIAM (Mrs. Francis F.) is an amateur gardener and lecturer of Mountain Lakes, N. J. She is Chairman of the Judging School of New Jersey, and served as Vice-chairman for the International Flower Show in New York.

MR. AND MRS. PERCY I. MERRY of Needham, Mass., are enthusiastic gardeners and lecturers. Their specialty is hybridizing Iris and Hemerocallis. Mr. Merry is a photographer as well.

SIGURD OLSON, of Winton, Minn., has been a Wilderness Guide for twenty-two years; he is a zoologist by profession.

DR. P. P. PIRONE is Associate Professor and Associate Research Specialist in Plant Pathology at Rutgers University, New Brunswick, N. J.

DR. LOUIS PYENSON is Pathologist at the State Institute of Agriculture, Farmingdale, L. I.

MARY C. SECKMAN (Mrs. J. R.) is an amateur gardener of Clarksburg, W. Va., who has done much book reviewing, lecturing, and free lance writing on garden subjects.

J. MARION SHULL, of Chevy Chase, Md., was for many years connected with the U. S. Department of Agriculture. He has long been one of the foremost American breeders of Irises, Hemerocallis, etc.

CAROL G. WIETING is Nursery Foreman, University of Washington Arboretum, Seattle, Wash.

DR. DONALD WYMAN is Horticulturist of the Arnold Arboretum, Harvard University, Jamaica Plain, Mass. He is the author of several books and many articles on trees, shrubs, and other woody plants.

ISABEL ZUCKER is Garden Editor of the *Detroit Times* and Contributing Editor to the *Michigan Gardener*. She had her first garden when she was two, and won her first blue ribbon at the age of six.

PLANTS GARDENS

Early-flowering cherry, *Prunus subhirtella*

NEW SERIES

Winter, 1946

VOL. 2—No. 4

CONTENTS

Cover.....	Willows in winter, Brooklyn Botanic Garden
Authors whose Articles Appear in this Issue.....	Page 2 of cover
Frontispiece.....	Ice after the storm, Brooklyn Botanic Garden 194
Director's Letter.....	195
Articles Condensed or Reprinted	
We Need Wilderness.....	National Parks Magazine 196
Small Shade Trees for Small Properties.....	American Nurseryman 200
Making New Chestnut Trees.....	Yankee Magazine 202
How to Use DDT.....	American Forests 205
Before You Build.....	American Home 208
Vats Full of Vittles.....	Collier's 210
Care of the Small Greenhouse.....	Arborctum Bulletin, University of Washington 212
Manures or Chemicals?.....	The Home Garden 215
Medicine from Earth.....	Fortune 217
Disease Takes Increasing Toll of Elm Trees.....	New York Herald Tribune 220
The Biggest Bargain You Can Find.....	House Beautiful 226
H-F Day.....	The New Yorker 228
Columnar Trees Worthy of Growing.....	American Nurseryman 230
The End of the Boxwood Leaf Miner.....	Flower Grower 232
How to Give Daylilies a Perfect Setting.....	Flower Grower 234
Christmas Decorations	
Begin with the Tree.....	Mary C. Seckman 237
Trim the House.....	Ellen B. Carder 237
Choose Interesting Material.....	Elizabeth B. Merriam 239
Make the Wreaths and Garlands.....	Isabel Zucker 240
Deck the Hearth.....	Percy I. Merry and Ruth P. Merry 242
Selected List of Recent Non-technical Books, Magazine Articles, and Experiment Station Bulletins.....	243
Within the Brooklyn Botanic Garden.....	251
Index to Volume 2.....	253

Unless otherwise credited, drawings by Michalena L. Carroll;
photographs by Louis Buhle.

The Editor was assisted in the preparation of this issue by Michalena L. Carroll, Elizabeth Clarke, Charles F. Doney, Arthur H. Graves, Elizabeth Hess, Sally Kelly, Conrad B. Link, Hester M. Rusk, Gertrude M. Smith.

JOHN C. WISTER, *Editor*

Published quarterly at Prince and Lemon Streets, Lancaster, Pa., by the Brooklyn Botanic Garden, Brooklyn, N. Y.
Entered as second-class matter, May 26, 1945, at the post-office at Lancaster, Pa., under Act of August 24, 1912.
Subscription included in Botanic Garden membership dues. To others: \$2.00 per year; \$3.00 for two years.
Copyright, 1946, by the Brooklyn Botanic Garden.



Ice after the storm, Brooklyn Botanic Garden

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN 25, NEW YORK
TELEPHONE: MAIN 2-4433

Winter, 1946

TO OUR FRIENDS:

There is a binding, genial, and generous fellowship among the GROWERS OF LIVING THINGS. It is a fellowship that has spread with Man over the earth -- since he discovered that by carefully planning and harvesting crops he could enjoy relative plenty. Left to his own, the GROWER is a man of peace, good-will, and friendly understanding. PLANTS & GARDENS dedicates its future to the service of GROWERS all over the world.

ABOUT THIS ISSUE:

Many readers will recall that the feature of the first Winter number of PLANTS & GARDENS, published a year ago, was a selection of the year's non-technical articles of outstanding interest and significance in gardening and horticulture. It was so well received that we are repeating the practice this year.

It is a special pleasure to honor the authors and publishers of the original articles by reproducing or condensing them in this review issue. The Editor and his editorial committee have worked tirelessly to bring you what they regard as an important cross-section of the articles of the year -- articles of permanent interest. By all means bind them for perennial reference and make use of the index.

IF YOU LIVE WITHIN 100 MILES OF THE GARDEN, NOTE THIS DATE:

APRIL 16, 1947: The BROOKLYN BOTANIC GARDEN'S second annual post-war Conference on Community Problems with Plants is to be held on Wednesday, April 16. The central theme this year is control of noxious plants. Lawn weeds, poison ivy and ragweed will come in for their share of attention. The Conference is limited to 150 participants; early reservations are urged.

The Spring number of PLANTS & GARDENS will give detailed information about the Conference.

HOLIDAY GREETINGS from all here.

Sincerely yours,

George Sherry, Jr.
Director



WE NEED WILDERNESS

To rejuvenate our spirits

Sigurd Olson

Condensed from National Parks Magazine,
January–March, 1946

ACCORDING to Webster, wilderness is a trackless waste uninhabited by man. To the people of America it is far more than that. It is something so closely tied up with their traditions, so tightly woven into their cultural backgrounds, their emotions and philosophies of life, that it cannot be ignored or neglected.

Wilderness to the people of America is a spiritual necessity, an antidote to the high pressure of modern life, a means of regaining serenity and equilibrium.

For Perspective

People go to the wilderness for many things, but the most important of these is perspective. They go to the wilderness for the good of their souls. Henry Thoreau sensed this need of mankind when he said "We can never have enough of nature. We must be refreshed by the sight of vast and titanic features—the wilderness with its living and decaying trees. We need to witness our own limits transgressed and some life pasturing freely where we never wander."

There is a school of thought that considers wilderness solely as an opportunity for nature study and scientific research

and sees no spiritual value in the effect of wild country on those who come in contact with it. These people lack vision, for unless the accumulation of such knowledge furthers man's sense of companionship with the earth, and thereby contributes to his spiritual contentment, it has not achieved its purpose.

There is another group made up of practical-minded individuals who see no sense in setting aside an area for esthetic or recreational purposes. They look at the last remaining bits of primitive America as a final opportunity to "get rich quick" in the best pioneer tradition. They are the ones who would dam Yellowstone Lake, cut the last sequoias, and convert the canoe country of the Quetico-Superior into a huge storage reservoir. They also need the wilderness but their need is blinded by greed.

There is a third group larger than all the rest. That is the great mass of recreation-minded Americans who see the wilderness not as an opportunity for exploitation or for the furtherance of knowledge, but rather as an opportunity to satisfy a vital spiritual deficiency within themselves. They are the ones who head into the wilderness regions because they must. Wilderness to them is a tonic, a panacea for nervousness and monotony. They go to it once a month or once a year as a sick man might go to his physician. These people know that wilderness to them is a necessity if they are to keep their balance.



Hileman photo

Alpine firs in Glacier National Park; Heaven's Peak soars in the distance

There are men who crave action and distance and far horizons beyond the steel. They must know wild country and all that goes with it. They must know hunger and thirst and privation and the companionship men know only on the out trails of the world. When they find themselves on some bare glaciated point a hundred miles from town and gaze down a great wilderness waterway, they know the meaning of communion with nature.

For Spiritual Refreshment

Others find their wilderness in the mountains of the West. There, camped in some high alpine meadow, with jagged peaks towering above them into the snow-capped summits of some mighty range, and all about them the beauty and gran-

deur of the high country, they find their particular ultimate. To them such a setting is the primitive on a noble scale—there a timelessness that can never be approached elsewhere. They come down from the mountains refreshed spiritually and ready again for the complexities of life among their kind.

Be these wilderness places large or small, mountains, lakes, deserts, swamps or forests, they do fill a vital need. Gradually wilderness has become a cultural necessity to all the people of America; and while it plays an important recreational role, its real function will always be as a spiritual backlog in the high-speed mechanical world in which we live. We have discovered that the presence of wilderness in itself is a balance wheel and an aid to equilibrium.

On the French River, Ontario

Canadian Pacific Railroad photo



City life is artificial. Because artificiality may lead to a sense of unreality and frustration, unhappiness often results. That is the price a people pays for high technological success, and that is the reason an intelligent, thinking people knows that unless it can break away and renew its contact with a slow-moving natural philosophy, it will lose its perspective and forget simplicity and wholesomeness.

Wilderness Preservation

In recognition of this now almost general need of our people, the National Park Service, the U. S. Forest Service, and the various States have wisely set aside many areas that may be classed as wilderness—areas dedicated to the spiritual welfare of all.

Farsighted conservationists have fought hasty developmental programs that had as their goal the exploitation of the few remaining sections of wilderness. Sometimes they have won, but more often they have lost because as a people, Americans still do not realize the importance of wilderness preservation as an investment in future happiness.

One highly encouraging aspect of the wilderness problem is the realization that as a nation we are approaching cultural maturity. Now, for the first time, we

are able to look back and see where our mistakes and short-sighted policies have brought us; and at long last we are slowly emerging from the old pioneer concept that governed our thinking for the past three centuries. We can see that we have squandered a national heritage of beauty and wealth and have only a few places left to remind us of the continent's past primeval glory.

We know now just how valuable these fragments of the old America have become to us as a people. We see them now in a new light and realize that in addition to being museum pieces of the past, they are vital to our happiness, and investments in national character. We also know that if we are to retain our contentment and balance, then we must never lose our contact with the earth, never forget the pioneer traditions of independence and resourcefulness under primitive conditions, never for a moment exchange the philosophy of the backwoods settler and Indian fighter for the comparative ease of the modern city. The real purpose of the preservation of wilderness is to give the people of this country an opportunity to renew their old associations as a race, to find themselves and their real qualities, to rejuvenate their spirits through simple living in the out-of-doors.



DOES DDT STIMULATE PLANTS?

Some observers believe that any apparent stimulation resulting from the use of DDT (or any other insecticide) is really due merely to the removal of the pests. But according to a report in the *AIF News* for May, 1946 (published by Agricultural Insecticide and Fungicide Association), tests on insect-free plants

showed definite stimulation of all parts of the plant. The concentration giving the greatest stimulation was about the same as effective insect-killing dosages on bean plants, but much lower on cucumber and squash plants, and higher on carrot and potato plants. If confirmed by other workers, these results will be important.

SMALL SHADE TREES FOR SMALL PROPERTIES

Which ones are best, and why

Donald Wyman

Condensed from *American Nurseryman*,
March 1, 1946

INCLUDED in this group are trees which at maturity do not grow over 20 or 25 feet tall, or which can be maintained at that height with a minimum amount of pruning by the average homeowner. The trees in the following list are not necessarily hardy throughout the United States; nurserymen will know where they can be grown best.

Acer campestre (HEDGE MAPLE). A small, dense, round-headed tree. Autumn color, yellow.

Acer carpinifolium (HORNBEAM MAPLE). This tree has light green leaves, a rounded form, very fine foliage, and a bright brownish autumn color. It is not particularly hardy north of New York.

Acer Ginnala (AMUR MAPLE). A vigorous-growing, many-branched, dense maple of rounded habit, one of the hardest of ornamental plants. The fruits are usually red and conspicuous during the latter half of the summer. The fine foliage turns a brilliant scarlet in the fall.

Acer griseum (PAPER-BARK MAPLE). It is difficult to propagate; but its interesting paper-like brown bark makes it a desirable ornamental tree.

Acer mandshuricum (MANCHURIAN MAPLE). A close relative of our boxelder, it grows fast, and has scarlet autumn color and wide-spreading branches.

Acer palmatum atropurpureum (ORIENTAL MAPLE). The various Oriental maples are confused in the trade. The plant of this name growing in the Arnold Arboretum is as wide as it is tall. One can easily sit under its branches. It has proved perfectly hardy at Boston. Its leaves are red during the entire season.

Albizia Julibrissin rosea (SILK TREE). This strain is hardy even in New England. The species is used throughout the south. A small tree with wide-spreading branches, excellent for giving light shade to terrace, walk, or garden seat. Its flowers in early summer and its finely divided leaves throughout the growing season add to its ornamental effectiveness.

Carpinus caroliniana (AMERICAN HORNBEAM). It has rather wide-spreading branches, and leaves turning scarlet to orange in the fall. It can be used to give shade to walk, pool, terrace, or bench.

Cercis canadensis (REDBUD). This tree has horizontal branches, yielding excellent shade. Beautiful spring flowers and vivid yellow autumn coloration add to its seasonal attractions.

Cornus florida (FLOWERING DOGWOOD). This species and its varieties have horizontal branches which throw shade over a wide area, as for terrace, walk, pool, or garden seat.

Cornus Kousa (KOUSA). Tender in the extreme north; but where it proves hardy, it has many of the good qualities of *Cornus florida*.

Crataegus Crus-galli (COCKSPUR THORN). This hawthorn has glossy dark green leaves and wide-spreading, almost horizontal branches giving dense shade to anything that is under them. Susceptible to attacks of the lacewing fly.

Crataegus Oxyacantha Pauli (PAUL'S SCARLET HAWTHORN). Valued only for its flowers and some shade. Susceptible to attacks of lacewing fly.

Crataegus Phaenopyrum (WASHINGTON THORN). Upright in habit of growth. However, it grows rapidly, has excellent flowers and fruits, and deserve consideration for giving some shade on the small home grounds. Susceptible to attacks of the lacewing fly.

Euonymus Bungeana semipersistens (SPINDLE-TREE). A dense-growing mass of branches, this large shrub or small tree holds its leaves very late in the fall, producing shade after most other deciduous plants have dropped their leaves. Like most euonymus, it is susceptible to scale.

Euonymus latifolia (SPINDLE-TREE). A vigorous-growing large shrub or small tree of value because its leaves are almost the first to appear on any woody plant in the spring, offering shade for a long period. The flowers, like those on all euonymus, are inconspicuous, but the plant has red fruits and red foliage color in the fall.

Franklinia alatamaha (FRANKLINIA). Valued chiefly because of its large white flowers in the early fall, this will give most shade if grown with several leaders. The autumn color is a brilliant red to orange. Considered a shrub from New York north.

Halesia carolina (CAROLINA SILVER-BELL TREE). Covered with small, bell-like white flowers in early spring, it grows vigorously and has wide-spreading branches. The leaves turn yellow in the fall.

Ilex Aquifolium (ENGLISH HOLLY), **Ilex opaca** (AMERICAN HOLLY). Where hardy, these small trees give shade and protection from winds the entire year. As small trees, since their habit of growth is rather narrow, they should be planted in groups of at least three, to give worth-while shade. Both sexes should be planted.

Koelreuteria paniculata (CHINA-TREE OR GOLDENRAIN-TREE). This is not one of the best of the small shade trees; but the large yellow flower clusters in July, followed by the conspicuous greenish, bladder-like fruits, are ornamental when most trees have neither flowers nor fruits.

Magnolia salicifolia. A vigorously growing, very dense magnolia of pyramidal habit that can be used for shad-

ing. Its single white fragrant flowers are 4½ inches in diameter. Not so hardy as *Magnolia stellata*, but certainly as dense.

Magnolia Soulangeana. A round-headed tree with large leaves, widely grown for its flowers in early spring. It supplies shade, but the leaves are coarse and have no particular autumn color; and the plant is frequently susceptible to magnolia scale. Other trees with finer foliage are more suitable on the small home grounds.

Magnolia stellata (STAR MAGNOLIA). This is the hardiest of the magnolia tribe. Its many-petaled white flowers are sometimes suffused with pink. A perfect shade tree for the small grounds, but slow in growth.

Malus Arnoldiana, **Malus atrosanguinea**, **Malus Halliana** Parkmanii, **Malus HOPE**, **Malus FLAME**, **Malus purpurea aldenhamensis**, **Malus SISSIPUK**, **Malus Zumi calocarpa** (FLOWERING CRAB APPLES). Excellent shade trees for the small property, with good foliage. Those listed here are some of the best because of good flowers and fruits.

Oxydendrum arboreum (SURRELTREE). Excellent dark green foliage, nodding flower clusters in late summer, brilliant scarlet autumn coloration—a splendid small shade tree.

Pinus Bungeana (LACE-BARK PINE). A very interesting pine with remarkably outstanding exfoliating bark. It will have to be restrained somewhat on the small property.

Pinus Strobus (WHITE PINE). Easily restrained by proper pruning.

Prunus nipponica. Rather low, but dense in habit; beautiful in flower.

Prunus Padus Spaethii (EUROPEAN BIRD CHERRY). This large-flowered variety is similar, but superior as an ornamental, to our choke cherry, *Prunus virginiana*. It can be depended on to provide quick shade. *Prunus Padus* and its varieties are very vigorous in growth, and leaf out earlier in the spring than most trees and shrubs.

Prunus serrulata FUGENZO, **Prunus serrulata** KWANZAN, **Prunus serrulata** SHIROFUGEN (ORIENTAL FLOWERING CHERRIES). These three double-flowered varieties are the hardiest of the Oriental cherries. In good soil they grow rapidly and produce some shade. None will grow over 20 feet tall, and they are usually short-lived.

Prunus subhirtella autumnalis (HIGAN OR ROSEBUD CHERRY). Wide-spreading, often twice as broad as high, this is not a tree which one should plan to sit under, but one which should be allowed to have branches down to the ground. Its semidouble pink flowers are very pretty in the early spring, and a few often open in the fall.

Prunus yedoensis TAIZANFUKUN. This double-flowered variety is mentioned because the flowers are effective longer than those of the species. The branches of this tree are wide-spreading; hence it can be used to provide shade over seat, terrace, or steps. This also applies to *Prunus yedoensis*.

Styrax japonica (SNOWBELL OR STYRAX). Small leaves; wide-branched; small bell-like white flowers in mid-spring.

Styrax obassia (SNOWBELL OR STYRAX). Large leaves; flowers fragrant, in racemes; coarser than *Styrax japonica*, but a very striking specimen when in bloom.

Syringa amurensis japonica (JAPANESE TREE LILAC). The last of the lilacs to bloom, its large creamy-white flower clusters appear in mid-June. It really is a tree—should be grown with a single stem. A rapid grower, it quickly produces dense shade. Its bark is similar to that of a cherry tree.

Tsuga canadensis (COMMON HEMLOCK), **Tsuga caroliniana** (CAROLINA HEMLOCK). Can be restrained at almost any height and can easily be grown with one or several trunks. These are both excellent evergreen trees for the small property.



MAKING NEW CHESTNUT TREES

What we are doing, and how you can help

Arthur Harmount Graves

Condensed from *Yankee Magazine*,
September, 1946

THE American chestnut, growing from northern New England southward in the Appalachians to Alabama, was attacked during the '90's by a deadly parasitic fungus introduced into this country on imported Japanese or Chinese trees. For a time the stowaway worked unnoticed, but it was at length (1904)

discovered on native chestnut in the New York Zoological Park in New York City. Now, after 50 or 60 years, our fine American chestnut tree has all but disappeared. Only scattered shoots, with perhaps a few isolated large trees in the high-mountains of the southern Appalachians

The principal value of the chestnut was in its timber—long-lasting and not easily subject to decay. Its tall straight trunks were invaluable for telegraph and telephone poles. Many old farmhouses have sills and construction timbers of chestnut. The bark was precious for its tannic acid content, used in tanning leather.

In comparison with the timber, the value of the nuts was slight, but many of us remember when we went chestnutting in the crisp October days.

Breeding

The only way to outwit the parasite is by tree breeding. The Japanese and Chinese chestnuts resist the attacks of the parasite so effectively that certain individuals of those species are practically immune. However, these Asiatic chestnuts are generally low-growing and can not replace the tall American chestnut as timber-producing trees. We therefore conceived the plan of breeding these low-growing, disease-resistant Asiatics with the tall, susceptible American, in the hope that in some of the offspring the desirable characteristics (namely the tall, erect growth of the American parent and the disease resistance of the Asiatic parent) would be combined. This breeding was begun in 1930. The Division of Forest Pathology, United States Department of Agriculture, has undertaken similar work and has been cooperating with us through the years.

Japanese-American

The Japanese species was available for breeding, and the result of the combination of American and Japanese chestnuts was at first encouraging. The hybrids showed great vigor and rapid growth—an expression of the phenomenon of "hybrid vigor," well known to all geneticists. In most cases they possessed the erect habit of the American parent—with a straight central trunk, not bushy and bushy like the Japanese. But they are still susceptible to the blight, although not nearly so much so as is the American parent.

But, as Dr. D. F. Jones, Geneticist of the Connecticut Agricultural Experiment Station (who is also cooperating with us), says, "The disease resistance is *in* these hybrids. If we put in resistance at the beginning, it must be still there (although 'recessive') and continued

breeding should eventually bring it out."

At the age of 7 years or so, these hybrids, taking after their American forebears, began to get the blight and die; but at the bases of the diseased hybrids, or

Japanese-American hybrid showing inarching. To keep diseased trees alive for breeding, it is often necessary to graft vigorous shoots into the trunk above diseased areas.



below lesions caused by the blight fungus, vigorous shoots began to appear. I believed that if we could graft the tips of these shoots *above* the blighted area we could "bridge" it so that the communication of living bark above, and roots below, would be restored; this method of grafting (or more correctly "inarching") has been successful, so that we still have our Japanese-American hybrids, and have continued breeding with them.

Chinese Japanese-American

At the beginning the Japanese chestnut was the only Asiatic kind available for breeding. But I soon found that the Chinese species, some fine seedlings of which were given us in 1929 by the Division of Forest Pathology, United States Department of Agriculture, was the most disease-resistant of all species; and the crossing of this with the American chestnut began in 1934. In 1938 we began crossing our Japanese-American hybrids with the Chinese; and this combination, i.e. *Chinese Japanese-American*, seems to date, the best. Inoculation tests have shown that individuals with this pedigree in most cases do not take the disease.

However, in these *Chinese Japanese-American* hybrids, the spreading habit of the Chinese parent is dominant; and this year we are adding the American species to the combination to give it a more erect character. In a few cases the *Chinese Japanese-Americans* do show an erect habit. And this year, through the kindness of Mr. Michael Evans of Greenville, Delaware, and Professor Maurice A. Blake of the New Jersey Agricultural Experiment Station, I have received a supply of pollen from tall, erect Chinese individuals, which we have applied to our most desirable hybrids.

As far as the production of nuts is concerned, the Chinese species seems satisfactory. Most individuals seem to be perfectly disease-resistant; and we find that care (i.e., a little cultivation, pruning, and fertilizing) increases resistance to the blight. The nuts are large and

sweet. The nuts of the Japanese—often larger than those of the Chinese—have usually a somewhat bitter taste, although this tends to disappear on boiling.

On our plantation at Hamden, Connecticut, we have had nearly 400 bagged flowering branches this summer, representing 72 combinations in which different trees are involved. We have there and at the plantation at the White Foundation at Litchfield, Connecticut, and at the Yale Forest in Tolland and Windham Counties, Connecticut, about 1,000 hybrids plus about 1,000 more trees of species, representing nearly every kind of chestnut known—from Europe, northern and southern United States, and Asia. This year the project is receiving the support of the Connecticut Geological and Natural History Survey as well as that of the Division of Forest Pathology, United States Department of Agriculture, and, of course, of the Brooklyn Botanic Garden.

Help Wanted

How can you help us? In two ways. First: by sending us pollen of the American chestnut. It is getting scarce. Roots of chestnuts resist the disease more than do the trunks and branches, so that when a tree dies above there is time for shoots to arise from the base; and sometimes these grow old enough to bear flowers before being laid low by the disease. But flowers are getting less frequent.

Second: if you find nuts borne on any of these native shoots we shall be glad to receive them, and will plant them and label the resulting trees with the name of the finder and the locality. But the nut (usually ripe about the first week in October) should not be allowed to dry for drying kills the embryo so that the nuts will not germinate. They should be wrapped in sphagnum or peat moss, moist cotton, or something of the sort, so that they will not dry in transit; and mailed to me at the Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn 25, New York.

HOW TO USE DDT

To provide effective control of insects on forest, shade, and ornamental trees

A. G. Hall

Condensed from *American Forests*, April, 1946

WHILE much is yet to be learned of the effects of DDT, and newer developments and more thorough tests are in progress, sufficient knowledge has been gained to enable entomologists to recommend DDT's use for specific insect control purposes. In this article, the most up-to-date information is summarized for the guidance of persons who wish to utilize the new insecticide on shade, ornamental, and forest trees, the field in which it shows the greatest promise.

Forms

In commercial practice, DDT dusting powders are made by adding the pulverized DDT to fine-ground talcs, clays, sul-

fur, or other materials to produce the required strength. DDT may also be purchased as wettable powders, oil solutions, or emulsion concentrates. A supply of a 25 or 30 per cent emulsion concentrate will permit the homeowner to make almost any concentration he needs for a specific purpose, as it may be diluted. From a few teaspoonfuls to a half cup of so high a concentrate in a gallon of water will produce an emulsion strong enough for any shade or ornamental tree application—and is perfectly safe to use.

Limitations

In its powdered form, DDT is harmless to people and other warm-blooded animals unless taken internally. This is true also of emulsions and water suspensions, although some of the emulsifying agents may act as irritants. Oil sprays should not be used on animals or living plants because these are absorbed by the surface tissues. If parts of the body become wetted with oil solutions, they should be washed well with soap and warm water.

Copyright, 1946, The American Forestry Association, 919 Seventeenth Street, N.W., Washington 6, D. C.

Spraying DDT by plane

U. S. D. A. photo



Entomologists and insecticide manufacturers recognize DDT as another insecticide, more powerful in some respects than certain of the others, but by no means *the* insecticide. Other insect killers which have proved to be effective should not be replaced by DDT, just because of its popularity. For example, derris powder, containing rotenone, has long been used to rid house cats of lice. DDT powder will do the same thing, but since cats lick themselves, it will also rid the house of cats. On the other hand, DDT can be used safely in powdered form on dogs, but should not be used in oil solutions, since the DDT will be carried through the skin and may have serious effects on the dog itself.

Dispenser

A very convenient dispenser for DDT is provided in the aerosol "bomb," which was developed for use by the military forces during the war. The Army's most recent specifications for such bombs

call for about 3 per cent DDT and about 2 per cent pyrethrum. The bomb is a light weight container of steel, usually about pint-sized, from which an aerosol or mist is discharged through a valve. At a temperature of 70 degrees the liquid propellant changes to a gaseous state with great rapidity and expands to 260 times its liquid volume. The tiny particles remain in the air for about 20 minutes. By combining pyrethrum and DDT, the bomb has a double effect against flies, mosquitoes and other insects in a room. The pyrethrum knocks the insects down, and the DDT residue, left on everything with which the mist comes in contact, deals death to any late comers. The aerosol bombs are now available to the public. They are ideal for use by campers, and may be used also in the home and greenhouse.

Use on Shade and Ornamental Trees

About the use of DDT on shade and ornamental trees, there is much conflict of opinion among laymen.

DDT in limited applications may be used to protect shade and ornamental trees against most of the leaf-eating insects. The unsightly tent caterpillar is especially susceptible to DDT, as are most of the caterpillars. If the branches of the tree are sprayed with a $\frac{1}{10}$ per cent DDT emulsion a few days before the eggs begin to hatch, the tree should be safe from caterpillar attacks. Or the nests may be sprayed as they begin to form.

This same emulsion may be applied against locust leaf miner, boxwood leaf miner, cankerworms, gypsy moths, sawflies, elm leaf beetles, the catalpa sphinx, evergreen bagworm, mimosa webworms and other defoliators. DDT causes death to insects by its effects on nerve centers. It produces paralysis and finally death in from a few minutes to several hours.

The female cankerworm crawls up the trunk of the tree to deposit her eggs, and the gypsy moth caterpillars also crawl up and down the tree trunks between

Long-handled sprayer for high trees

U. S. Forest Service photos



feeding periods. These and similar trunk climbers can be controlled by the simple expedient of spraying a broad band of DDT emulsion around the trunk, a few feet from the ground. All the insects which cross this lethal path are doomed.

Spraying may be done with hand or power sprayers; and the surface should be thoroughly wetted so that a residue of DDT remains after drying.

The householder, in controlling his local insect pests, should remember that the physician does not give the same medicine for all ills. If insect attack of one kind or another is sufficiently advanced, DDT may have to be used even if the ladybugs and other beneficial insects are killed in the process. One can always take care of the aphis, if necessary, with a nicotine spray, the same as he did before DDT became known.

As to upsetting the balance of nature by the use of DDT, the reason one uses an insecticide is because the balance has already been upset; and the use of an insecticide is the first step in returning nature to a balance.

Use in Forests

Experiments in the control of forest insects with DDT indicate that no other development in the past 25 years has offered so much promise, particularly for the control of defoliators. DDT is far more effective in low concentrations than any other commercial insecticide. Because of the small amount required, it is especially well adapted to application from airplanes, for the protection of extensive areas of valuable timberland.

Since DDT has proved to be by far the most economical of all insecticides for forest use (aerial application costing only about 2 dollars an acre as against 6 to 10 dollars for other types of insecticides), forest entomologists will do their best to develop concentrations and methods of application which will reduce the harmful insect populations without unwarranted danger to other forms of forest life.

Effect on Water and on Wild Life

In 1944, tests were made of the effect of DDT on water and wild life. On a 40-acre plot surrounding a 3-acre reservoir in Pennsylvania, DDT was applied at the rate of 5 pounds in 5 gallons of oil per acre. Within 3 days, $\frac{3}{4}$ inch of rain had fallen. Water samples taken from the reservoir and from the tap of a nearby factory showed less than one part of DDT per million parts of water. Such amounts of DDT constitute no health hazard.

DDT severely reduced the population of most insects in the forest, and of a number of species of aquatic insects on or near the surface of the pond. No effect was noted on bird life. In 10 or 12 weeks the fauna of the forest and pond were back to normal.

More extensive tests in 1945 showed that it is probably unsafe to apply more than one pound of DDT an acre over large forest areas.

In spite of their successes with insecticides, forest entomologists are more enthusiastic about the possibilities of controlling forest insects by means of good silvicultural practice. DDT promises to be a good means of keeping down heavy insect infestations until such time as forest management can be developed to the point where the forest areas themselves will be more resistant.

Knapsack sprayer for low trees



BEFORE YOU BUILD

Safeguard your trees

P. P. Pirone

Condensed from *The American Home*,
June, 1946

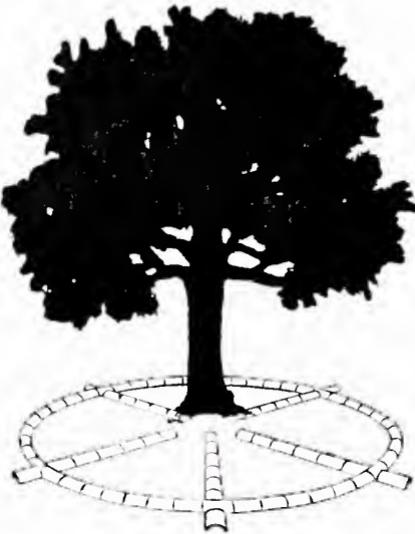
HOW satisfied you will be when your home is completed will depend on a number of factors. One of the most important is the treatment you give the trees that you find on your property. Even before the architect begins drawing plans, start thinking about how to preserve the trees.

Make sure that none of them will be needlessly sacrificed to make room for house, garage, driveway, fuel tank, or other structural feature. This may require some modification of the original architectural ideas. If there is any question as to the relative value of the different trees, get the opinion of a landscape architect, nurseryman, or other

horticultural expert. The skillful thinning of a stand of trees is more effective than the planting of an open site. Never remove a tree until the need and desirability of doing so are determined beyond doubt. There is a practical, as well as an aesthetic side to this. A tree that has grown with others is likely to suffer if several of its fellows are removed. It becomes more exposed to the force and the drying effect of winds; to the bark-scalding effect of increased sunlight; to the shock of changes in temperature.

Disposal of Subsoil

But saving the trees from destruction is only the beginning. Both you and the contractor may overlook some do's and don't's that are vital to their future health. You may feel that the only precaution needed will be to wire some boards around each tree trunk to prevent bark injuries



To protect a tree against soil fill—

1. Lay 4" drain tiles as shown.
Give 1' fall from tree to rim;
screen ends to prevent clogging;
extend some spokes beyond rim



Drawings by James Lewicki

2. Build open-joint dry well (of stone, brick, cement block) to height of fill. Leave plenty of space to allow for tree growth

Copyright, 1946, The American Home Magazine Corporation, 444 Madison Avenue,
New York 22, N. Y.



3. Stand 6" glazed tiles on spoke-rim junctions, with bell end up at fill level. Heap stones around to hold them upright



4. Cover whole area with rocks, then smaller stones, gravel, and thin straw layer to keep surface foot of topsoil from sifting in

That is a wise precaution, but it doesn't go far enough. The subsoil removed from the cellar should not be spread over the ground. Such soil is worthless until it has been weathered and improved in various ways and at considerable expense. Spreading it around may seem to be the quickest and cheapest way to get rid of it, but it is also a sure source of future trouble and regrets. Have the contractor cart away this impotent subsoil. If a little of it is used to smooth out a depression, insist that the existing topsoil be removed and placed to one side until the proper subsoil grade is secured, and then returned and spread over the surface.

Digging the cellar to a depth of 8 or 10 feet will cause some change in the surrounding water level to which near-by trees have become accustomed. Such a change is difficult to avoid. Every precaution must be taken to prevent handicapping the established trees in other ways. Many trips by bulldozers, trucks, and other heavy vehicles over the area

through which the tree roots spread will compact the soil for a considerable depth. This will disturb the delicate relationship between roots and soil. Some trees are more sensitive to soil compaction than others. The American beech, with its relatively shallow root system, appears to be especially susceptible. To avoid trouble, see if all heavy traffic over the property cannot be routed away from the vicinity of the trees.

Soil Fills

Even more serious than the damage caused by soil packing is that which results from soil fills. If you fill in low areas and cut off the higher land, and if large trees are growing in the affected spaces, consider the consequences of the grading. The addition of several inches of soil around trees may upset the root-soil balance; and the removal of soil will materially injure the root system. Both air (primarily oxygen) and water are essential for the normal functioning of

roots; roots become established within a certain stratum in the soil where these materials are present and where micro-organisms needed to break down the organic matter in the soil find conditions to their liking. When soil is spread over such a place, it causes a marked disturbance. There is less air at the greater depth where the roots now are, and when air is lacking, certain gases and chemicals increase and become toxic to the roots.

The degree of injury from soil fills varies. Beech, oak, sugar maple, and evergreens are most severely injured; birch and hickory suffer less; and elm, locust, plane, poplar, and willow still less. Weak trees are more severely injured than vigorous ones, and old specimens more than immature trees. Obviously, the thicker the soil blanket, the more serious the effects. Clay and subsoil fills cause the most injury because their fine particles shut out the air almost completely. Gravelly soils are the least harmful; and sometimes the addition of a layer several inches deep of loose, open soil will do no harm, especially to the less susceptible kinds of trees, while they are sending out

new roots nearer the surface. How to solve the problem of an unavoidable fill is explained in the sketches; but first, clear the ground around the tree, as far out as the branches extend, of all plants and sod. Next fertilize the tree according to standard tree-feeding practice, preferably by the crowbar hole method. Then follow the construction program illustrated in the four sketches.

Lowering the Soil Level

In the case of lowering the soil level, some means must be found of preserving the roots and the soil surrounding them over as large an area as possible. Sometimes a rounded mound can be left, or a mass of soil retained by an attractively designed wall or box of wood or masonry. Although the cost of any such method of meeting either of the emergencies described is likely to be high, prevention of injury is much cheaper and more successful than remedial measures when damage becomes evident. Unless you take such precautions, huge branches may begin to die within a year or two or the entire tree may succumb within five or six years.



VATS FULL OF VITTLES

A very simple plant provides food and medicine for man and beast

Leo Hirtl

Condensed from *Collier's*, Nov. 17, 1945

SOMETIMES when suffering from dietary deficiency, eat two tablespoons of dried brewers' yeast. You will get 10 per cent of your daily requirements of

proteins, all the B₁ vitamin you need, and from one fourth to one half of the other B vitamins. For this buff-colored substance, related to the yeast that makes bread rise, is literally loaded with vitamins, fats, sugar, protein, and amino acids.

Brewers' yeast can be grown in huge vats at a rate that no beef animal can match. A St. Louis company has been

turning out a ton and a half every 12 hours from 12 pounds of "seed." Washington University scientists have cross-bred various strains of yeast until they can be grown in a variety of flavors.

Some of the actual uses of yeast:—physicians use it in treating dietary ailments; the Red Cross distributes it in the South to combat pellagra; during the war, rations of the Russian and German armies were boosted with it; our own Army's K rations were so fortified; soup concentrates sent overseas contain either yeast or soybean.

Researchers have been experimenting with yeast in other nutritional diseases, cirrhosis, diabetes, anemia, and alcoholism. Yeast may even have something that checks the incidence of cancer. Dr. William DeKleine, director of the Michigan State Health Department has evidence that yeast might be useful in treating hypertension.

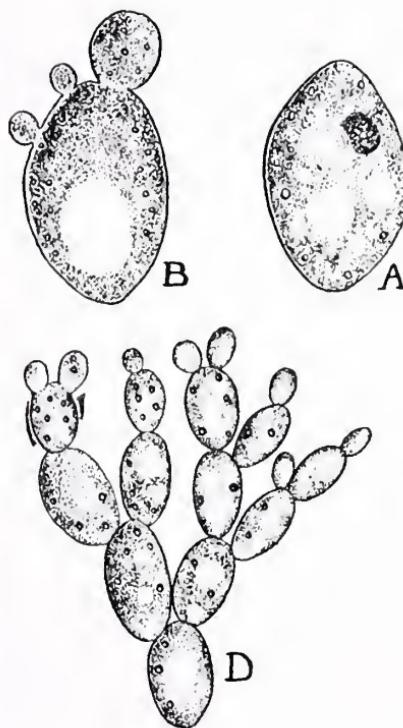
Manufacturers of livestock feed are making feeds that contain up to 5 per cent yeast. Egg production has been increased 25 per cent by feeds containing yeast; and each egg in turn will provide more Vitamin B than eggs from hens not given yeast.

Yeast is used to ferment a grain extract called wort, which ultimately becomes beer. As fermentation proceeds, the yeast triples in amount, and two thirds of this is offered now as food and medicine. Yeast comes from the fermenting vats as a light tan liquid with a bitter, hoppy flavor. If the yeast is to be made into a food supplement, it is treated in successively weaker salt solutions to remove the bitter flavor, and it winds up with a nut-like flavor that is pleasing.

Prolonged heating destroys vitamins, and so yeast is dried by flash methods. The liquid is either sprayed into a superheated chamber or picked up as a thin film on a revolving drum, becoming powder-dry in less than a second.

Yeast is a cheap food. Unfortified, bitter, dried yeast can be produced at 10 cents a pound. Debittered, fortified

yeast prices range upward to 68 cents a pound. Calculations by the New York Office of War Nutrition Service have it that the quantity needed by the average man is so low that he can get all of the highest price yeast he needs for 300 working days at the cost of 67 cents.



Yeast plants, magnified two to three thousand times.

- The individual plant consists of a single cell.
- Plant beginning to multiply.
- Colony formed after two hours' multiplication and growth.



CARE OF THE SMALL GREENHOUSE

*Robots for ventilating, heating,
air circulation, humidifying, and
even watering*

Carol G. Wieting

Condensed from *Arboretum Bulletin*, Uni-
versity of Washington Arboretum
Foundation, Spring, 1946

OME of the worst of the worries of the small greenhouse owner should soon be solved. Before long he may be able to confine his greenhouse pleasures to the week-end and live free of care the balance of the week; for equipment may

soon be available to take care of ventilating automatically while the owner is away. Greenhouse owners have had to worry day and night about ventilation and heat control. Especially on variable days is this important. Often clouds shift about, giving alternate periods of sun heat and cool shade. The gardener leaving home in the morning of a cloudy day might leave the ventilators closed. Then if the sun came out he would worry or telephone home to have the ventilators opened. Plants which have been growing at a temperature of 50 degrees can suffer if the temperature rises rapidly to 80 or 85 degrees.

Type of greenhouse now available to the homeowner

Lord & Burnham photo





Motor for automatic control of greenhouse ventilators

This is not a new problem. One orchid fancier has solved it by having automatic ventilating, heating, air circulation, and humidifying. The only thing left to be done by hand is watering and shading. This automatic control is brought about by a series of thermostats in combination with small motors, combinations such as are used as damper controls in some residences. The thermostat is installed in the greenhouse in a central place and a motor a few feet below the ventilators, which can be counterbalanced with weights so that only a little energy is needed to open them. The chain from the lever on the motor is attached to the lever on the ventilators. The thermostat is adjustable to operate the motor at any temperature. If the thermostat is set at 70 degrees and the temperature in the greenhouse rises above

that point, the motor automatically raises the ventilators, and closes them when the temperature falls. If the temperature continues to rise after the ventilators are open, another thermostat operates a fan in the wall which draws in cool air nearer the floor. Still another thermostat operates an overhead humidifier. Here, the chain from the motor operates a quick control valve which allows warm water to be discharged through atomizers along the roof of the greenhouse. When the temperature falls, the water is turned off automatically. As soon as reliable humistats are available, one can be used to replace the thermostat that operates the humidifier.

Automatic watering is entirely possible. For gravel or soilless culture water-tight benches are used, which can be flooded with liquid nutrients. When the liquid



has covered the roots of the plants it is drained away into a storage tank. A similar method could be devised for watering pot plants plunged in gravel in a water-tight bench; the bench could be flooded and drained periodically with a time clock arrangement. Even without any automatic device, it is possible to reduce the amount of watering by filling the benches with moist peat moss and plunging the pots into them. This will reduce the amount of watering by about a third and relieve one of much worry on warm days.

Automatically watered greenhouse bench



TO KEEP POTATOES FROM SPROUTING

Everyone who stores potatoes for food would like to keep them from sprouting. This desire may soon be realized, as a result of research at Cornell University and elsewhere (described in *Dow Diamond*, September, 1946). It has been found that potatoes treated with a certain chemical before they are stored are delayed in sprouting, and remain large and firm all winter. The same treatment is effective for root crops, such as beets, carrots, and turnips. This chemical is one of the synthetic plant hormones, akin to those that gardeners use to hasten the formation of roots on cuttings; it is the methyl ester of alpha naphthalene-acetic acid. It is easily and economically

applied; the vegetables may be dipped in it, or sprayed or dusted with it; or shredded paper may be impregnated with it and mixed with the vegetables in storage.

This new substance has no effect on the flavor or food value of potatoes. It is already being used by a few large commercial dealers, and it is expected to be on the market in time for the home gardener's use next year.

The investigators have not yet determined exactly how long sprouting is delayed, and so for the present this new chemical is not recommended for potatoes stored for planting.

MANURES OR CHEMICALS?

Something about earthworms, too

R. Milton Carleton

Condensed from *The Home Garden*,
March, 1946

Manures

I BELIEVE in the importance of organic matter in the soil. Without it, no matter how perfect a mixture of silica, mica, calcium, and other mineral elements we may put together, we do not have a soil. True, plants can be grown in synthetic plant-supporting media made in this fashion, and grown well. Some of the outstanding scientific discoveries in the field of plant nutrition have been made using these same synthetic soils. Yet the very scientists who made these discoveries will emphasize the need for organic matter in true soils. Without organic matter the control of certain minor elements of plant nutrition is difficult. In soils well supplied with organic matter, this control is not so critical. Released slowly as decay progresses, the minor elements are fed to the plants at about the right rate for normal growth. If excessive quantities are supplied, humus acts as a buffer against too high concentrations. Because of this buffering action alone, humus is an essential ingredient in every soil.

Organic matter is an important source of plant nutrients, too. Nitrogen, the most important, is released slowly from humus, so slowly that there is never any danger of overfeeding plants in soils well supplied with this important organic substance. It has been estimated that 2 per cent of the nitrogen in humus becomes available each year, so that a liberal application of compost may last 50 years. (South of the Mason-Dixon Line the breaking down of humus goes on at a higher rate.)

Most perennial plants—including trees and shrubs—in the north temperate zone seem to be roughly adjusted to a rate of growth which can best be maintained when organic nitrogen in soil is released at approximately 2 per cent a year. Thus when we want to maintain the growth of permanent plantings, plenty of well-rotted organic matter (broken down to a point where it will not release nitrogen too rapidly) is a must.

Chemicals

Let's have a look at what plants absorb and use for growth, and see what it is. The only form in which plants can absorb nitrogen, the key material in growth, is nitrate nitrogen. Nitrate nitrogen does not occur in any quantity in free form in soils. It gets into soil under natural conditions in only one way—by the breakdown of proteins. This is a long process carried on by various bacteria and fungi. After an involved chain of breakdown—protein, proteose, peptone, amino-acid, ammonia, nitrite, and nitrate—each step releasing additional byproducts, our plants can feed.

So far, we have been talking about the breakdown that comes within a single season (or, as we move any distance north of the Ohio River, in two seasons). After this first stage, with its liberal release of nitrogen rising to a sharp peak as settled warm weather begins, we have left a brownish, fluffy material, humus.

Humus continues to break down, but at a much slower rate than fresher organic matter. In the rate of breakdown of *fresh* or undecomposed organic matter we encounter the most serious defect of natural fertilizers. The inherent danger of injury to plants because of delayed nitrogen breakdown is one that no exponent of natural manures ever admits. I have seen devotees of this art dump on huge quantities of organic mat-

ter in early spring, or plow under a cover crop of rye that stood knee-high before being turned under. For a while, nothing would happen except that the plants would not make the spectacular growth the proponents of organic manures promised. Some of them might even show signs of nitrogen deficiency. Then, with the coming of warmer weather, the plants would pop up overnight.

In a flame of living green the garden would reach its climax—midway through June. Suddenly the plants would turn brown and either die or survive as feeble relics of their former glories. By the time the heat of summer came, the damage would be done. But instead of blaming the real culprit—an excess of soluble nitrogen created by the rapid breakdown of proteins by bacteria as the soil grew warmer—we would hear about the terrible effect of hot weather on gardens.

This condition, known as "delayed nitrogen burn," is rarely recognized by the novice gardener. Even the old hand is too often ignorant of its effects. The damage is so far removed from the action of early spring, when the manure was spread, that the connection between the two happenings is lost.

The element that did the damage is the same nitrate nitrogen that the gardener could have applied as ammonium nitrate. If it had been applied early in the spring when plants could have used it gradually, all the fire would have died down by the time hot weather came. Moreover, the dose could have been calculated to the job, rather than being applied as an inaccurate dose in organic form.

We are safe in saying that no fertilizer is wholly good or wholly bad; each has its place. What we are trying to do when we fertilize is to supply the plant with the pure chemicals it *can* absorb, even if we have to break down complex compounds (which the plant *cannot* absorb) in order to make them available.

Both

What, then, can the gardener believe about fertilizers?

The foundation of any soil worthy of the name is organic matter. Without organic matter it is not a true soil (true soils must include clay, too). This organic matter, which should be in the form of humus if possible, acts as a buffer against excess soluble salts, absorbs plant food elements and releases them as plants can use them. It also supplies (in the process of decomposition), additional plant food elements; acts as a reservoir for soil moisture; favorably affects soil texture; houses and protects the vast population of bacteria, protozoa, and fungi essential to proper soil functions, and in many other ways aids the gardener in his efforts to grow plants. The gardener must at all costs maintain or increase the organic content of his soil, even if he has to go to a considerable amount of expense to do so. I would prefer to see that organic matter composted for at least a year before application.

But I would not depend entirely on organic matter to feed my plants. If I were growing an orchard, I would not rely on organic sources of plant food except when the trees were young. Heavy bearing is not characteristic of the apple tree in nature; when we make demands on it beyond the needs of normal reproduction we must provide additional plant foods. In growing annuals, I would use inorganic chemicals rather than natural manures, as a main source of plant food. This would be particularly important in early spring.

I confess that I know practically nothing about what plants really need. I'm sure that many a top-ranking scientist would admit this. Since we do not know exactly what plants need, we must let the plants themselves tell us. If a certain course of fertilization produces strong, healthy plants, there is every reason to believe that the plants are thriving on the diet that is being supplied to them. And

anyone who denies that perfectly good plants can be grown with modern chemical fertilizers just doesn't know the score.

Earthworms

A final word about a commonly held theory of natural fertilization: Earthworms! The devotees of these slimy soil denizens insist that true soil is impossible without them. They contend that good plants cannot be grown unless the fertilizing elements evacuated by these little friends are present.

If this theory were true, most of mankind would be headed for starvation. Some of the most important plant growing operations in the world have been located on soils in which no earthworms live. There are rich truck-garden areas in Michigan, New Jersey, California, and Indiana, to mention only a few, where a fisherman would have to walk a hundred miles or more to find a spot where he could dig bait. Abroad, vast areas in horticulturally-important Holland, Den-

mark, and Italy boast nary a worm. The volcanic soils of Japan, that support one of the world's most concentrated populations, perhaps cannot afford to support earthworms in addition. Actually, the effect of earthworms on soils has been grossly exaggerated: a single application of well-rotted compost plowed under in spring will supply as much organic matter and will turn the soil particles more than earthworms on the richest soil can in fifty years. Incidentally, earthworms propagate freely only in rich soils where their efforts are not needed. In poor soils, low in organic matter, they do not thrive.



E. Melady

MEDICINE FROM EARTH

Penicillin, streptomycin, and other new antibiotics spring from the earth's most primitive life

Condensation reprinted from the July 1946 issue of *Fortune* by special permission of the Editors.

OVER half a billion years ago, a momentous event occurred. A handful of the earth's basic elements drifted together into a new combination, producing protoplasm, the fundamental ingredient of life. What happened next is a subject of controversy. According to one widely held theory certain molecules of the protoplasm began to arrange themselves into simple units, the bacteria, probably the first form of life.

In time new forms appeared—algae, fungi, and other microorganisms. Evolution proceeded, populations grew, and inevitably antagonisms flared up among the microorganisms over space, food supply, etc. The result of this warfare was the establishment in the soil of a state of equilibrium. Certain bacteria abandoned independent existence altogether and took up the parasitic habit of living on others. These bacteria eventually invaded higher animals, marking the birth of disease.

Since then, every form of life has been caught in a desperate struggle against disease. The plant and animal parasites that produce disease are everywhere. It is against man himself that disease producers reach the peak of their frenzy.

Sometimes man's defenses overpower the invader; sometimes the parasites win, and the diseased body of the victim returns at last to the soil.

Fifty years ago bacteriologists began to ponder the fact that most parasitic invaders apparently perish with their victims in the soil. Did the earth itself produce some substance fatal to disease germs? Here's the answer: many soil-inhabiting microorganisms produce substances that are poisonous to the parasites. The discovery that these substances had medicinal value led to the development of penicillin, streptomycin, and such drugs, that gave man a new strategy.

The Long-drawn Battle

Throughout the war on disease, the bacteriologists have dreamed of an offensive weapon, a powerful drug capable of killing disease producers without harming the host. Ehrlich's "Magic Bullet" of 1909, an arsenic compound that attacked syphilis without killing the patient, opened a new branch of medicine, chemotherapy, that was to flower spectacularly with the development of the sulfa drugs a generation later.

Powerful as the sulfa drugs were upon streptococcal infections, pneumonia, etc., these chemicals lost prominence to a new group of naturally-occurring substances, the antibiotics. Between 1939 and 1944 scientists obtained these new drugs from bacteria, fungi, and other soil-inhabiting microorganisms. Sixty years ago Pasteur knew about antibiotic activity. In 1929 Professor Alexander Fleming of St. Mary's Hospital, London, discovered penicillin when he noticed that a mold, *Penicillium notatum*, prevented the growth of some bacteria. Another antibiotic, gramicidin, was soon discovered by Dr. Rene J. Dubos of the Rockefeller Institute for Medical Research. Gramicidin, isolated from the soil-inhabiting bacterium, *Bacillus brevis*, cured such things as leg ulcers and infections of the chest cavity, sinuses, and the skin.



Photo courtesy Rollin Hotchkiss
Gramicidin crystals, magnified about 100 times

At Oxford, investigations into antibiotics made bacteriological history. Penicillin was isolated and its potentialities recognized. Steps were taken to get penicillin into large-scale production—with the cooperation of the United States. United States companies went into penicillin production in 1942, and with improved techniques penicillin output had spiralled by 1944.

The search for new strains of Penicillium that gave high yields of the antibiotic went on. A strain isolated from a cantaloupe showed great promise, and treatment with x-rays and ultra-violet light raised its penicillin production to a new high.

Most Promising

There were antibiotics still to come. Penicillin was no cure-all for certain diseases, among them tuberculosis, bubonic plague, typhoid fever, and tularemia. After three years of sifting through hundreds of soil-inhabiting microorganisms for antibiotics, Dr. Selman Waksman of the New Jersey Agricultural Experiment Station at Rutgers came up in 1943 with a microbe named *Streptomyces griseus*, yielding streptomycin, which had desirable antibiotic properties. Tularemia, influenzal meningitis, some pneumonia, and blood poisoning were among the diseases attacked by streptomycin. As for its value in combatting tuberculosis, the authorities prefer to reserve their judgment.



Small piece of the streptomycin-producing fungus, magnified about 2000 times



Schenley Research Laboratories photos
Chain of reproductive spores, magnified about 3500 times.

Bacitracin, Newest Member

Bacitracin, the newest promising antibiotic, was isolated from a strain of *Bacillus subtilis* by scientists at Columbia University's College of Physicians and Surgeons. Active against many of the same diseases as penicillin, bacitracin may surpass penicillin for local treatment of wounds and for application of the drug orally.

The Pendulum Swings

Unfortunately, as new antibiotics appeared, disease germs showing resistance to the drugs also appeared. Streptococcus infections that resisted sulfa-treatment broke out; some commercial penicillin

did not cure syphilis. The cry "Penicillin is Losing its Punch" went up; actually penicillin is a mixture of at least four widely differing chemical substances, and the potency of the commercial preparations depends upon the fractions of the different penicillins they contain. It so happened, for example, that the irradiated strain which had so boosted penicillin production also boosted the amount of the syphilis-ineffective component of the commercial product.

Although medical opinion has changed its original highly optimistic appraisal of antibiotics, the conquest by penicillin and streptomycin gives hope that all disease producers will be confined.



WILL GREEN PLANTS PRODUCE ANTIBIOTICS, TOO?

In the above article it is stated, regarding streptomycin, "As for its value in combatting tuberculosis, the authorities prefer to reserve their judgment." This is where some of the higher plants, the green ones, may come to the rescue; for it has been shown that certain water-soluble derivatives of chlorophyll retard the growth of the tubercle bacillus, the germ that causes tuberculosis. (This work was done by Sylvester Daly and

others at the College of Physicians and Surgeons, Columbia University, New York, and reported in Proceedings of the Society for Experimental Biology and Medicine, October, 1939.)

Chlorophyll is the substance responsible for the green color in all green plants. Most of the plants familiar to the layman are green plants; the microorganisms mentioned in the above article are not visible to the naked eye.

DISEASE TAKES INCREASING TOLL OF ELM TREES

New remedies needed for Dutch fungus and virus

Robert S. Bird

Condensed from *New York Herald Tribune*,
September 30 and October 1, 1946

THE Dutch elm fungus and a virus disease of the elm are killing off the nation's favorite shade tree at a rate that is bound soon to alter the character of the American landscape.

One or both of these deadly diseases are ravaging the native American elm almost unchecked in 18 states, though up to now the virus pest has not crossed into the East from the infected region west of the Alleghenies. But the Dutch elm fungus, despite the expenditure of \$27,000,000 to combat it, has spread to 13 states in the East and Middle West. In the last 3 years it has doubled its area of infection from 18,000 to 36,000 square miles. In the vicinity of New York it is killing trees 5 to 10 times faster this year than last. Everywhere it is smiting stately giants and young saplings without distinction, and the disease is creeping deep into New England, where half of all the shade trees of 6 states are elms.

Research

Researchers have discovered the origins of the fungus disease in this country, traced its arrival here from Europe during the late 1920's, and tracked its course along the railroad rights of way into the Middle West; have observed all the minute processes of the life cycle of *Ceratostomella ulmi*, the scientific name for the fungus; have watched the fungus grow in the life-giving layers of tiny tubes which are the water-conducting vessels of the tree; have cultured the fungus in the laboratory, extracted its toxins, re-inoculated trees artificially.

They have learned the feeding and breeding of the *Scolytus multistriatus*, the tiny brown bark beetle that sneaked into the country with the fungus to make itself thoroughly at home here, and to serve as the carrier of the fungus spores and as the agent for inoculating healthy trees; have studied the life of *Hylurgopinus rufipes*, a native bark beetle which also transmits the spores now, but does a less efficient job of inoculating the tree.

History

The Dutch elm disease had been identified in the Netherlands as early as 1919, and about the same time it was found in Belgium and France. It spread quickly in Europe and crossed the channel into England, where in a few years it has destroyed tens of thousands of the country's most beautiful and historical trees. Dr. Curtis May, of the United States Department of Agriculture's division of forest pathology, went to Europe to study the disease and upon his return here he alerted the nation's shade tree conference and the commercial nurserymen and tree experts.

Cross section of twig showing brown areas — a characteristic symptom of the disease

U. S. D. A. Bureau Entomology and Plant Quarantine (East Orange, N. J.) photos





European bark beetle (greatly magnified), chief carrier of Dutch elm disease

In 1930 Charles Irish, an arborist of Cleveland, Ohio, became suspicious of a sickly elm in that city. He knew that Christine Buisman, a Dutch plant pathologist, who had made a study of the Dutch elm disease, was visiting the Arnold Arboretum at Harvard University. He sent a specimen of diseased twig to her and asked if she could identify the ailment. She cultured the twig in the laboratory and announced the verdict—*Ceratostomella ulmi*, the Dutch elm disease.

Next, a gardener for a large estate in Cincinnati found the disease on a tree there. Scientific scouting of both areas disclosed that the disease was present in other trees. But how it got there remained a mystery, and the hope was that the disease could be localized and sealed off right where it appeared.

Three years later it popped up in the East. Richard Walter, city shade tree officer of Maplewood, N. J., found the disease in one of the majestic elms that grace Maplewood Park. This discovery caused the greatest alarm among tree men. Hundreds of trees were found to be diseased; and the farther they scouted the more they found.

How Disease Spreads

They reasoned that the disease must have been well established in New Jersey without their knowing of it, perhaps at

the same time or even before it took hold in Ohio. The first problem was to find out where it came from and how it traveled. Plant quarantine records offered no clue. Bales of customs records were sorted out and examined, and these provided the tip. Certain furniture factories, mostly located in the Middle West, prized a particular wood veneer made from burled elm. Elm burls do not occur on trees in this country, but in Europe they were often found on elms that grew on roadsides or in open country; seldom ever on elms in the forests. Nobody knows what causes them, but the deformed trunk growth gives a kind of bird's-eye-maple effect in the finished wood veneer.

Between 1926 and 1930, it was learned from the customs records, about a hundred shipments of the burled elm logs had come into this country, most of them into Hoboken, Baltimore, and Norfolk. The detective scientists started tracing them. They found the logs were shipped over no less than eight railroad systems. They scouted along the railroad tracks and, just as they had feared, here and there they found evidences of the fungus and the European bark beetle, both of

Egg and larval galleries made by European bark beetle



which must have been present in the infected logs from Europe.

Scout Railroad Tracks

Freight trains had carried the logs through Maryland and Virginia and through New Jersey and Pennsylvania, and to the Middle West. They scouted 13,000 miles of railroad track where fungus and beetles which had made their homes in the logs may have been dropped or blown off the flatcars. In some places, such as Brunswick, Md., and Portsmouth, Va., they found both beetles and fungus, and the disease had gained some headway. In other places they found that though the fungus had fallen from the logs and was thriving in dead elm wood, it was perfectly harmless because the beetles, the inoculating agent, had not established themselves. In other places they found the alien beetle had jumped from the trains and had founded settlements in the new world, but had not happened to bring the fungus spores with them.

In still other places, like Cincinnati and Cleveland, none of the European beetles was found, but the American bark beetles were present and they had implanted the fungus spores in live trees and touched off the disease.

Invades Canada

Wherever all the conditions needed for the disease to flourish were present, it made headway. It crossed over to a part of West Virginia, and spread over New Jersey into eastern Pennsylvania and into Westchester and southern New York State; up the Hudson Valley to Saratoga Springs, into Connecticut all the way to the Rhode Island border, up the Connecticut Valley into western Massachusetts, and into a corner of Vermont; through all the eastern part of New York, and into two central parts of the state where railroads had taken log shipments.

A separate area of infection developed in the province of Quebec, Canada, in

1945, and that now is spreading southward to menace parts of New York State where the disease has not yet been found. The Canadian infection is believed to have been caused by shipments of war material into the Dominion, possibly through elm wood staves on crates.

Symptoms and Control

As the fungus grows in the tree, the leaves of the affected branch may wilt and dry up, or turn brown and drop off altogether.

There are two important experiments under way for combating the Dutch elm disease. The first is a direct attack on the fungus itself, and involves exploration in a whole new field of plant pathology. This involves the feeding of medicine into the water-conducting vessels of the trees. It is called the internal medicine treatment, and is being developed at the Connecticut Agricultural Experiment Station at New Haven by Dr. James G. Horsfall and Dr. A. E. Dimond.

Achievements Inconclusive

After achieving some good, but inconclusive, results from treating laboratory plants and young trees on experimental plots, they are now giving the medicinal doses to large diseased elms on the famous New Haven Green adjoining Yale University.

Oxyquinoline benzoate is forced into the soil around the tree's feeding roots at 600-pounds pressure, and the chemical is quickly taken by the root system directly into the water-conducting tubes. The liquid is also being applied to a lesser extent by watering it on the ground, and by injecting it through pipes threaded into the tree. A difficulty is that the plant pathologists have no means of determining how much of the chemical reaches the diseased parts, or how long it stays there. It appears to revive wilted branches, but the chemical cannot be detected in the tree's photosynthetic or respiratory processes.



Native bark beetle (greatly magnified), a less efficient carrier of the Dutch elm disease

The other experiment is directed at the beetle. It is a DDT spray technique, under which the insecticide is blown on the trees in the form of a mist at a velocity of 120 miles an hour. Most of this work is going on under Federal auspices at East Orange and Morristown, N. J. experimental plots.

While the elm trees wait for science to find a better way of dealing with the fungus disease, they must suffer from a harsh sanitation method that is the only other solution the entomologists and plant pathologists have to offer. The theory is that the spore-carrying beetles breed only in dead or recently dying wood; therefore, destroy the breeding places as promptly as they appear. This means that every diseased part of a tree must be ruthlessly cut off and burned; that every bit of dead elm wood, standing or lying on the ground or stacked in a woodpile, must be got rid of quickly.

A vast Federal Dutch elm control project, in which the States contributed, was based on this theory and flourished wonderfully in the earlier years of the Dutch elm menace. Then loss of Federal emergency funds, loss of Works Progress Administration labor, and of State funds and emergency labor, all combined to cause a virtual collapse of the project.

While the Dutch elm disease spread in 9 years from 6 to 13 states, the money put up to fight it by Federal and State governments was slashed from \$4,756,-

788 in 1937 to a paltry \$383,775 this year. The full-time Federal field force on Dutch elm control was cut in the same years from more than 6,000 men to 66.

Phloem Necrosis a Virus Disease

The virus disease, phloem necrosis, is an even deadlier killer than the Dutch elm fungus. Almost nothing is known about the virus; neither what it is, nor how it is transmitted, nor how or when a healthy tree is contaminated. The virus is believed to have been present in the Middle West, particularly in the region around Kentucky, possibly since the turn of the century. Blights of elm in previous years which were not identified at the time are now believed to have been caused by the present virus, which has been on its newest rampage for 4 years now.

The virus disease is spreading, or ragging, in at least 9 Middle Western States, including some where the Dutch elm disease has gained a foothold. The general area of infection embraces parts of West Virginia, southern Ohio and Indiana, all of Kentucky, parts of Iowa, Kansas, Missouri, Illinois, and Nebraska, and 6 isolated centers further south.

As a killer of elms the virus disease is so efficient that in Columbus, Ohio, for example, there are 30,000 virus-killed elms standing in the streets today waiting to be removed. The rehabilitation job will cost an estimated \$2,225,000.

Egg and larval galleries made by native bark beetle





WINT



LENDOR

Gottsch-Schleisner photos

THE BIGGEST BARGAIN YOU CAN FIND

Nursery stock

Gardiner Ewing

Condensed from *House Beautiful*, May, 1946

IN the purchase of a young tree, shrub, or plant you're actually getting more for your money than for any other investment for your home. Why do plant materials cost as they do?

Here are some of the hurdles the nurseryman has to get over, to end up with any profit:

1. He must have a great acreage of land, far greater than the space needed for, say, a factory producing the same dollar value in merchandise.

2. He must plant large portions of this acreage, at regular intervals, in cover crops that are unsalable.

3. Public fads make certain species of plants or trees out of fashion almost overnight. The nurseryman has to go to the expense of keeping these outcasts in good health until they become popular again.

4. There are big expenses involved in handling small orders.

5. There are peak seasons (spring and fall) and slow seasons; but the nurseryman has to maintain a full labor force the year around.

6. Most nurseries give a year's guarantee on any material they plant themselves. Often plants die through neglect or ignorance on the part of their owners, but the nursery takes the loss.

7. Acts of God can cause enormous losses. A block of elms, started from small cuttings, and laboriously brought up to be healthy 15- or 20-year-old specimens, prime for selling, can be wiped out overnight by an ice storm. Unusual spells of drought often cause drastic losses in stock and, in any case, take additional labor and expense for irrigating and watering. Heavy rains, coming at planting season, may kill many types of young plants. All of these weather factors must be counted in as possible losses when the nurseryman prices his products.

FLOWERING DOGWOOD

● It takes 11 to 12 years of constant care to produce a dogwood 12' high, or 2½" in caliper, to sell for \$25.

● Maintained as seedling for 2 to 3 years. Set in green house bench until well rooted and ready to graft.

● Selected wood grafted under humid conditions. Takes 5 to 6 weeks to adhere. Trimmed back to understock and moved to other location after knitting.

● Moved to frames in April, kept there until graft has knit thoroughly, usually about 1 year.

● Set out in rows in field. Cultivated and pruned after first year. Staked if necessary. About 10% die when first set out.

● Maintained 3 to 4 years, root pruned or transplanted to get good roots.

● Protection provided from rodents and rabbits. Loss due to cracking of bark and borers, from 5% to 75%.

● Sprayed each year as protection.

● Ground cover crop planted, manured, limed, cultivated before transplanting third time, at 8 to 10 feet height. Spaced widely to permit specimen growth.

● Ready for sale as specimen when about 12 feet high or 2 to 2½ inches in caliper.

FORSYTHIA

● It takes 3 or 4 years of constant care to produce a forsythia shrub of three to four feet in height, selling at about 75¢ for run-of-the-row plant, \$2 to \$3 for specimen plants.

● Shrubs are started by cuttings rooted in sand in greenhouse bench. Skilled workers are required for this operation. Cuttings are left in sand for about two to three weeks.

● Shrubs are then removed to small pots and set on greenhouse bench. They must be "hardened off" by gradual lowering of the temperature. Then pots are moved into cold frames and "cooled off" until ready for planting in field.

● Must be cut back to ground first year, after transplanting into open field. Specimen plants must be transplanted again for wide spacing, and sprayed twice a year. Average grade, usually bought for filler material, is not widely spaced or sprayed.

UPRIGHT YEW

- It takes 12 years of downright mollycoddling to bring an upright yew to about 4 feet in height, when it will sell for around \$5. This tree would never make any nurseryman rich.

- It can be propagated by three methods, but the most successful one is by cutting. Cuttings must first be rooted in sand. Because yews are slow to root, they are best started in late summer or fall. It takes about 4 to 5 weeks to root, and 15% to 25% of the cuttings never mature. This work must be done by highly skilled, well-paid workers.

- When rooted, the cuttings are put into 2½-inch pots in cold frames, and held there for one year—which means more skilled labor.

- Rooted cuttings are then transplanted into open fields, and spaced fairly close together at the start. It takes about one year for them to get established. They grow only about three inches a year for the first three years.

- The young trees must be transplanted every three years. Once well established, their rate of growth is about four inches per year.

- Trees must be sprayed for aphids yearly, although yews are good disease-resisters; even so, it takes 15 years for each tree to grow to about 4 feet in height.

WHITE PINE

- It takes 14 years of constant nursery care to produce a white pine tree 15 feet high which will sell, balled and burlapped, for around \$50.

- Tree is propagated by sowing seed in frames in the early spring. The seed bed must be especially prepared to avoid damping off. Tree is maintained as a seedling for about two years.

- Plant is moved to another bed when about 4 to 6 inches high. Then it is carried on for another 2 years before it is possible to move it into field.

- After transplanting outdoors, it takes about one year to get established before new growth begins. Then rate of growth is about one foot per year.

- It must be root-pruned or transplanted every 3 years. Then it gets corrective pruning, as required, to shape it into a good specimen. It must be sprayed about twice yearly until it is ready to sell.

NORWAY MAPLE

- It takes 10 years of constant care to produce a Norway maple tree 12 to 14 feet high, 2 to 2½ inches in caliper. It sells, bare root, for around \$10. To produce a maple 22 feet high, 3 to 4 inches in caliper, requires 20 years' care, and it sells for about \$40.

- Seeds are sown in beds, irrigated and maintained for one year.

- One-year seedlings are planted out, irrigated and maintained until they are about 3 years old.

- After 2 years they are cut back almost to ground to insure straight stems and main leaders. About 13% are not strong enough to carry on after this cutting.

- Specimen trees moved out for permanent planting in land specially prepared. Spaced 2 to 3 feet apart per inch of caliper.

- Must be sprayed 2 or 3 times each season, cultivated 5 or 6 times each season, and pruned to shape yearly. Must be maintained for about 16 years for a 3-inch caliper tree—about 20 years for 4-inch caliper.

- Most economical to handle is a tree 2½ inches in caliper as it can be moved bare root. After that, trees up to 4 to 5 inches in caliper are balled and burlapped. Sizes over that are balled, burlapped, platformed. Difficulty of handling large sizes pushes the cost way up.

EVERGREEN AZALEA

- It takes 6 to 7 years of constant care to produce an evergreen azalea 18 inches high which, balled and burlapped, sells for \$7.50.

- Propagated by cuttings in special soil in greenhouse. After rooted, put into 2½ inch pots and put in frames when cuttings are about 3 to 4 inches high.

- Held in frames for 2 years until hardened. Then transplanted into field into special peaty, acid soil.

- It takes 1 to 2 years to get established before growth starts. When 3 or 4 years old, plant is 6 inches high under ideal conditions. Then growth is about 4 inches per year.

- Spraying is required several times each year, but no pruning except in pot stage. The roots are fibrous, so it is not necessary to root-prune.

- Generally sold when about 18 inches high. If maintained until 2 or 3 feet high, the price jumps way up.

H-F DAY

Reprinted without change, from *The New Yorker* (August 24, 1946), with its permission. Pictures added

ON August 15th, the day on which hay-fever sufferers are supposed to begin to suffer, really and officially, we encouraged our staff hay-fever sufferer to go out and look into certain aspects of the problem. He returned, sneezing like a fool, and submitted a batch of tear-stained notes. Herewith some data. In the first place, eighty-five per cent of the hay-fever cases are caused by ragweed pollen, and ragweed pollen becomes abundant on August 15th, or H-F Day. Pollen clouds have been found thirty miles out at sea and seventeen hundred feet in the air. Various other weeds, as well as trees and wild flowers, are troublemakers, too, but ragweed is king. From August 15th to October 15th, some twenty-five trillion pollen grains float in the air in and



around New York City. Twenty-five trillion. And twenty-five grains of pollen per cubic foot will put a hay-fever sufferer in misery: bleary eyes, sneezing, nose drops, gin, profanity, prayer, and such. One large ragweed plant has been known to shed eight billion pollen grains in five hours, enough to use up eighty-six carloads of Kleenex. Hay-fever pollen grains are yellow, light in weight (even as such things go), dry, and powdery, and vary in diameter from one one-hundredth to one ten-thousandth of an inch. Under a microscope, they resemble dried peas, golf balls, soccer balls,

Spraying ragweed with 2,4-D

New York City Department of Health Bureau of Health Education Photo



and medicine balls. Magnify a ragweed grain to the size of a quarter and you see a crater-pocked planet. Pollen grains have no evil intent. It's not their fault. They are merely trying to get from the male to the female plant, and unless some kind insect gives them a lift, they can only float helplessly about. The grains are hardy. They retain their fertilizing qualities for a year and their ability to demoralize an allergic human being for generations. A Dr. August Thomen reported in 1927 that ragweed pollen which had been preserved in a private herbarium from 1887 until that time was still as noxious as ever.

On the constructive side, our hay-fever man investigated dichlorophenoxyacetic acid, the chemical known as 2,4-D, now being sprayed over ragweed by the Health Department. He was told by Dr. George S. Avery, Jr., director of the Brooklyn Botanic Garden, that 2,4-D has many advantages over other weed killers, almost all of which sterilize the soil, poison everything in the vegetable kingdom they touch, corrode sprayers, and are deleterious to human beings and animals. Animals and people can eat 2,4-D safely, but Dr. Avery knew of none who make a practice of doing so. If used discreetly, it does not sterilize soil, and it is neither a fire hazard, a hand stainer, an insect killer, nor expensive. An eight-ounce

can, costing a dollar, mixed with water in a ratio of one to a hundred, effectively slays the ragweed in sixteen hundred square feet of lawn. The chemical is marketed commercially as Dandy-Kill, 2,4-Dow Weed Killer, Du Pont 2,4-D Weed Killer, Scott's 4-X, Weed-an-All, Weed-No-More, Weedone, and Weedi-cide. Besides making a sucker out of ragweed, 2,4-D hastens the ripening of pears and bananas, has removed wild onions from the White House lawn (they were picketing the place), and, in small doses, makes apples cling to trees longer than is their wont. For the last use, however, Dr. Avery suggested alpha-naphthalenacetic acid, which sounds reasonable. It seems that there is some mystery about how 2,4-D operates. "Dichloro interferes with some basic enzyme system. It uses up starch in the plant roots more swiftly than it is used up naturally," Dr. Avery told our man, "but whether that is how it kills the stuff, I just don't know." (A week or so ago, in discussing this matter, we stated that 2,4-D makes the roots explode. We are still holding to this theory, as long as Dr. Avery doesn't know.) At any rate, 2,4-D is a slow killer. It often requires a month for the job, and our man says he can't wait. He's putting out to sea.

—Copyright 1946, The F-R Publishing Corporation.

GRIGSBY'S RAGWEED COMPROMISE

There are two ways of preventing ragweed from causing hay fever. One way is to kill the plants before they shed any pollen; the other is to let the plants live, but prevent them from forming pollen. There are places where the latter method is preferable, places where ragweed plants, rendered harmless as far as hay fever is concerned, are better than no plants at all. In Michigan, for example, many uncultivated areas are covered with a dense growth of ragweed which serves to prevent soil erosion. Dr. Buford H. Grigsby (in Michigan State College Agricultural Experiment Station Quarterly

Bulletin for May, 1946) recommends, for such places, controlling pollen formation without killing the plants.

Half the concentration of 2, 4-D used for killing mature plants will *stop* pollen production after it has begun; and one fourth of the usual strength will *prevent* pollen formation if it is sprayed on the plants just before the flower stalks lengthen. Sprayed plants produce very few seeds; and so in the course of a few years ragweed would disappear and would be gradually replaced by other plants which would serve to protect the soil.

COLUMNAR TREES WORTHY OF GROWING

*As street trees, for screen plantings, or for accent points on the home grounds**

Donald Wyman

Condensed from *American Nurseryman*,
June 15, 1946

VARIOUS articles have appeared in horticultural magazines during the past years concerning columnar trees. It is difficult to determine why more of these trees are not grown in nurseries. It may be that the demand for them is decidedly limited. It may be that nurserymen are not familiar with sources of propagating material. It may be that, because they all must be grafted or budded, they are so expensive to grow that nurserymen, in general, favor other plants that are more lucrative.

Maples

There are at least four columnar maples worthy of mention. The fastest-growing varieties are *Acer rubrum columnare* and *Acer platanoides erectum*. Fast-growing columnar trees are needed to compete with the poplars, especially the Lombardy poplar. Our specimen of the columnar red maple [in the Arnold Arboretum] came from the old Parson Nursery, at Flushing, L. I., in 1889, and is now at least 60 feet tall and 20 feet through. Another plant from similar stock is 50 feet tall and only 10 feet through. A red maple may have weak wood, but to the best of my knowledge these trees have never been injured by snow or ice.

The variety of the Norway maple, now called *Acer platanoides erectum*, origi-

nated as a single tree in the Mount Hope cemetery, at Rochester, N. Y. It was originally noticed by B. H. Slavin and has since been widely propagated and distributed in the Rochester area. This has been incorrectly termed variety *ascendens* and variety *columnare*. One specimen in the Arboretum is 30 feet tall and 6 feet through at its widest part near the base of the tree, the rest being a mere 2 feet in diameter. Another variety called *columnare* has been described.

The sentry maple (a fastigiate variety of the sugar maple), *Acer saccharum monumentale*, was originally found growing in a cemetery at Newton, Mass., over 60 years ago; it was first propagated in the Arnold Arboretum in 1885. Young plants may be very narrow indeed; our mature specimen at the Arboretum is about 60 feet tall and 8 to 12 feet through at the top. This variety grows slowly. Because of its erratic growth while young, it had best not be used for street tree planting.

Elms

At least a dozen different elms can be classed as fastigiate trees; all mentioned are growing in the Arnold Arboretum. First come the selections of the American elm, like Moline, Littleford, Princeton, Lake City, one botanical variety called *columnaris* and another variety *ascendens*. The last-named variety was largely developed by B. H. Slavin, of the Rochester parks; and there are streets in Rochester, N. Y. planted exclusively with it. We have a tree of Princeton 25 feet tall and only 8 feet through, and another tree of Lake City with similar dimensions; but larger, more vigorous trees might be twice this width. Our largest tree of Littleford is 15 feet tall and only 4 feet through. All are good.

* If your nurseryman lacks any of these, he can get stock of most of them either from the Arnold Arboretum or from the Parks of Rochester, N. Y.

There are also five varieties of the smooth-leaf elm (*Ulmus carpinifolia*) which have been widely used in Europe. These, as a rule, do not grow so vigorously as the varieties of the American elm just mentioned, and in general their habit is smaller; hence they have value in situations where great height is not desirable. Also, they tend to be densely and narrowly pyramidal, rather than definitely columnar in habit.

One variety of the Scotch elm might be mentioned, *Ulmus glabra exoniensis*, since it is growing 40 feet tall in the Arboretum and is only 10 feet in diameter at the base.

Other Columnar Trees

There are other columnar trees which can be classed as vigorous-growing. The upright-growing forms of the English beech, *Fagus sylvatica fastigiata*, and the English Oak, *Quercus robur fastigiata*, are both common in the trade and have been widely grown for many years. There is a fastigiate form of *Ginkgo biloba* also, and several nurseries claim to have it, but this plant grows in a most peculiar fashion. It will grow decidedly fastigiate for 30 or 40 feet and then all of a sudden one branch will revert to the wide-spreading habit.

One linden should be on every list of fastigate trees, *Tilia americana fastigiata*. Decidedly columnar in habit, it grows 18 to 24 inches per year. Our plant, 30 feet high, is only 6 feet in diameter.

Two poplars are worthy of note, *Populus alba pyramidalis* (often called *Populus alba Bolleana*) and *Populus Simonii fastigiata*. The Bolleana poplar is commonly grown in nurseries, and the other should be. One of our plants of *Populus Simonii fastigiata* is 25 feet tall and a mere 4 feet in diameter. Its small bright green leaves make it an admirable substitute for the Lombardy poplar, which is extremely susceptible to canker disease.

One tree which should be mentioned

because of its beautiful flowers in late April and its fiery red autumn color is the columnar form of the Sargent cherry, *Prunus Sargentii columnaris*. Easily 30 feet tall and 7 feet through, our plant has several main leaders. Pruning so that a single trunk remains undoubtedly makes a more desirable tree. Because of its ornamental potentialities, its comparatively vigorous growth, and its freedom from serious pests, this is one columnar tree which should be widely propagated.

Smaller Trees

Another columnar Oriental cherry is *Prunus serrulata Amanogawa*. This has semidouble, light pink flowers, but is definitely in the smaller group of fastigiate trees, seldom growing over 25 feet tall. It is especially suited to formal plantings and is not unattractive as a lawn specimen.

There is also a columnar form of *Cornus florida* which has arisen in the Arnold Arboretum. Growing about 25 feet tall, it is 12 feet in diameter and, although not truly columnar, it is showing every indication that it will retain a narrower habit than is customary with dogwoods. A fastigiate form of the Washington thorn, *Crataegus Phacnopyrum fastigiata*, has been prominently displayed on the golf course in Durand-Eastman park, Rochester, N. Y., for several years and has promise as a small fastigiate ornamental, with good flowers and splendid red fruits.

Evergreens

Certain varieties of red cedars and arbor-vitaes are obviously columnar. *Pinus sylvestris fastigiata* and *Picea Engelmannii fastigiata* are both very narrow in habit and very slow in growth, taking many years to grow into fairly usable specimens. *Pinus Cembra* can be in the narrowly pyramidal group; *Pinus Strobus fastigiata* is definitely narrow in habit when young, but with increasing age it begins to fill out, so that it is not dependably columnar throughout its entire life.

The 20 trees I have listed as not to be recommended have been accepted at various times as worthy of growing because of their columnar habit. All but one of these have been growing in the Arnold Arboretum for many years; and because of their various shapes now, I think they should be discarded as columnar trees. Those recommended keep their columnar form permanently and hence are eminently superior to those 20 which have conclusively proved—here in the Arnold Arboretum—that they do not retain their columnar form when mature.

There are undoubtedly many other good (and bad) varieties of columnar trees growing in this country. Other varieties might be accepted (or rejected) after they have been fully compared with those mentioned here.



Trees Not Recommended: Not Permanently Columnar in Habit

- Acer saccharinum pyramidale*, silver maple
- Aesculus Hippocastanum pyramidalis*, horse-chestnut
- Carpinus Betulus fastigiata*, European hornbeam
- Carpinus caroliniana pyramidalis*, American hornbeam
- Cercidiphyllum japonicum*, katsura-tree
- Crataegus monogyna stricta*, English hawthorn
- Liriodendron Tulipifera fastigiatum*, tulip-tree
- Magnolia acuminata*, cucumber-tree
- Malus baccata columnaris*, Siberian crab apple
- Malus florentina*, crab apple
- Malus robusta erecta*, crab apple
- Malus robusta fastigiata*, crab apple
- Populus nigra italicica*, Lombardy poplar. One of the most popular columnar trees, yet it should be discarded because of a serious canker disease.
- Pyrus communis*, pear
- Robinia Pseudoacacia erecta*, black locust
- Tsuga canadensis fastigiata*, hemlock. Too slow in growth and too narrow satisfactorily to weather winter storms without annual protection.
- Ulmus carpinifolia cornubiensis*, smooth-leaf elm
- Ulmus carpinifolia Wredei*, smooth-leaf elm. Because of yellowish leaves, I do not think it desirable.
- Ulmus hollandica Klemmer*, elm
- Ulmus hollandica superba*, elm

THE END OF THE BOXWOOD LEAF MINER

A sure and easy way to eliminate it completely

Louis Pyenson

Condensed from *Flower Grower*, January, 1946

FOR years boxwood lovers have struggled valiantly to protect this valuable ornamental from the persistent attacks of the boxwood leaf miner.

New Control

Now a truly remarkable eradicating agent has been found which promises to reduce the boxwood leaf miner to a mere memory. Experiments conducted on the grounds of the N. Y. State Institute of Agriculture have shown that one spraying with this insecticide, properly timed and applied, has the power to eliminate every single leaf miner that emerges from a bush, even though emergence may

stretch over a three-week period or more.

The insecticide that does the trick is the much publicized DDT, which has the remarkable power of destroying some insects when they merely touch it with their feet even weeks and in some cases months after it is applied. That is the secret of DDT's amazing effectiveness on the mosquito-like adult miners who must rest on the sprayed leaves for some time before they are capable of flight.

Forms and Dosages

Two forms of DDT were found effective—the water miscible powdered form containing from 20 to 50 per cent actual DDT, depending on the company manufacturing it; and the dissolved-in-miscible-oil form, which contains 20 per cent by weight of DDT. The powdered form may require a good sticker-spreader and has the disadvantage of leaving a visible residue on the foliage. The miscible oil form is preferable, as it leaves no visible residue and may stand more weathering.

The dosage of the powdered form varies with the DDT content. One pound of actual DDT should be used with each 100 gallons of water. This means $2\frac{1}{2}$ pounds of powder per 100 gallons of water if its actual strength is 40 per cent DDT; or 4 pounds per 100 gallons if its strength is 25 per cent DDT. Twice this recommended dosage does not injure the boxwood, and leaves a residue that is effective for a period of over one and one-half months in spite of heavy rains.

The miscible oil form of DDT known as Gesarol Emulsion was used at strengths of 1 gallon to 100 gallons of water and 1 gallon to 400 gallons of water. There was no injury to the foliage and the same complete kill was accomplished even with the more dilute dosage during the entire emergence period, although several heavy rains fell during that time. Since the dilute dosage did not have as rapid a killing effect as the strong, it seems best to recommend 1 to 200 dosage.

Time

The best procedure is to apply the spray as soon as the head ends of the



Author photo

Pupae with dark heads indicate time to apply DDT

pupae in the leaves begin to darken. This can be detected by careful periodic examination and generally occurs the first or second week in May in the latitude of Long Island. These observations should always be taken on plants on the south or southwest side of buildings or wind breaks, as adult emergence in such locations may begin a week earlier.

The application of the DDT spray must be made before any emergence occurs, and must be thorough, so that both sides of the foliage are covered.

Warning

There is only one dark cloud to this happy picture. There appears to be a tendency for the boxwood mite to build up to injurious numbers because of the use of DDT, which is evidently effective against the parasites and predators of the mites but not against the mites themselves. However, boxwood mites can be easily overcome by dusting with sulfur or spraying with a summer oil.



Auth

Daylilies in the author's garden. Planted against a light-barrier of trees, the flowers turn toward the light—in this case north

HOW TO GIVE DAYLILIES A PERFECT SETTING

*To make them face us and show
their best features*

J. Marion Shull

Condensed from *Flower Grower*, July, 1946

WHAT is the ideal setting for daylilies in the garden? The answer is implied in the very nature of gardens and daylilies themselves.

Most gardens are so arranged that there is one main entrance point, and from this point paths lead to its various attractions. Whatever its size, the garden will usually have its definite metes and bounds, marked by hedge or wall, by banks of shrubbery or even tall trees—

barriers that cut off the view and set the garden apart from what lies beyond.

Daylilies, for their part, are highly sensitive to light and will face the stronger light from whatever direction it may come. At the same time, many varieties of daylilies, though immensely attractive when looked at from the front, are quite unimpressive when viewed from behind.

Here, then, in the nature of our usual garden design and in the characteristics of many daylily varieties, lies the key to their most effective use as fine garden material. Their ideal setting is against hedges, wall, shrubbery and trees that not only restrict the field of view but serve as light-barriers as well and thus cause the daylily flowers to face directly toward us.

Copyright, 1946, Williams Press, Inc., 99-129 North Broadway, Albany, N. Y.

Color

Planted on the north side of tall trees or shrubs, they will face their flowers to the north. If the garden is surrounded by shrubs or a wall, we have only to plant a border of daylilies just within this outer barrier, and we may then stand in the middle of our garden and have hundreds of blooms face us from every direction.

The colors available in modern daylilies (*Hemerocallis*) provide an almost infinite variety. They range from pale cream and lemon, through cadmium, gold, orange and golden brown, to bright red, bronze, maroon and blackish purples. A true white, of course, is still unattained, and there is no real blue. Neither do we have any reds of the crimson type, though vermillion reds are not only attainable but are already available to some extent.

Only the self-colored varieties, most of which are yellow, can properly be used in open plantings where the light comes in approximately equal strength from all directions, though even these varieties are more resplendent under the plan of marginal planting. Varieties like Harlequin, Carnival, the brown Emperor Jones, the bicolored La Tulipe, the blackish-red Vulcan, the redder but still blackish San Juan, and many others, carry their strong rich colors only on the inside. When planted in the open, with their flowers turning haphazardly in all directions, they are unpleasantly mixed up and quite ineffective. In the same class are other such outstanding varieties as Bagdad, Baronet, Mikado with its red petal spots that do not register from the rear, Rajah which loses its rich red eye-zone when seen from behind, Royal Ruby, the very dark Theron, and the red Wekiwa.

Height

Since most varieties, and certainly all double-faced ones, should be planted against something that will turn their heads, it becomes quite important to know the height to which each variety will grow. With heights varying from less

than 18 inches to 5 feet or more it is possible to build an almost solid wall of daylily blooms from near the ground to above eye level, with great latitude for harmonious or contrasting color effects. By careful selection of varieties with reference to color, height and time of bloom, there is no end to the enjoyment a gardener can derive from daylily plantings.

Distance from Barriers

Planting may begin directly against a wall. If the barrier is a hedge or shrubbery, allow at least 2 feet so as to lessen the root competition and to permit the daylily flowers to rise free of the overhanging branches but near enough to feel the cutting off of light. Where tall trees are involved, the nearness of planting differs somewhat with different species of trees. If the trees are deep-rooted like the oaks, and high or open-topped, the daylilies may be planted fairly close and still thrive and bloom even though little direct sunshine ever reaches them. Under such trees one may safely begin planting at a point halfway between the trunk and the outer reach of the branches and extend outward from that point to a considerable distance before losing the face-turning effect—say half the height of the tree.

Some other garden flowers fit into the daylily border exceptionally well, notably *Asclepias tuberosa* with its clusters of orange flowers, and the Shasta daisies to introduce pure white. These bloom along with the main crop of daylilies and work in beautifully with them.

The daylily garden should also have a few varieties that can be cut and taken indoors for bloom at night. A few that are suitable for this purpose are the Lemon Lily, *Hemerocallis flava* and *Hemerocallis citrina*; also Calypso, which is definitely a night bloomer, from 4 p.m. to 10 the next morning. Duchess of Windsor, like *Hemerocallis flava*, opens in the morning but stays good for nearly the whole 24 hours and so can be used as a cut flower at night.



Doorway decoration of sprays and garland

CHRISTMAS DECORATIONS

Five points of view

BEGIN WITH THE TREE

Mary C. Seckman

CHRISTMAS decorations need not be an extravagant display; but colors must harmonize and styles must be in keeping. A formal house demands dignity of style, just as a cottage calls for simplicity.

Most decorating plans begin with the Christmas tree. Whatever kind is chosen, it is well to select a freshly cut tree and, if possible, one with shiny green foliage. Norway spruce is a deep rich green, usually well formed and upright, and pungently scented. Long-needed white pine is decorative and long lasting; but since the growth is sparse, extra branches often need to be added. Hemlock is beautiful, with its graceful drooping branches, but will last only a short time indoors. Artificial trees have no appeal for the gardener; it is better to have no tree at all than a poor substitute.

On the front door a wreath may be hung, or a garland, swag, or spray. A

spray of white pine is pleasing, with evergreen cones in several sizes; a bright red bow covering the branch ends gives a cheery accent. A narrow long-handled basket brimming with balsam, berries, and cones may be hung on the door instead of a wreath. Embroidery hoops wrapped in white and twined with mistletoe make a gay welcome.

For the dining room table a centerpiece of fruit is suitable, with foliage of magnolia, boxwood, or the shiny green pachysandra to conceal the low sides of a bowl on a large tray or mirror. Only perfect fruit of the most enticing appearance is used to fill the bowl, and all colors are kept in harmony: oranges, tangerines, blue grapes, and golden bananas; grapefruit, limes, and lemons with purple grapes; polished red apples piled around white candles and surrounded with foliage. Whatever material is used, it should be kept in mind that the dining room table has a supreme place in the decorating scheme of Christmas.

TRIM THE HOUSE

Ellen B. Carder

A WREATH or spray may be made of any of the evergreens (hemlock, yew, spruce, pine, cypress, juniper, etc.) with the addition of a few clippings of the lovely reddish leucothoe, barberry (*Berberis verruculosa*), *Pachistima Canbyi*, or the choice mahonia; and trimmed with crab apples, sumac, barberry, rose hips, red peppers, red chokeberry, Cotoneaster, or cones.

With silver trimmings a few clippings

of the gray Meyer juniper are good, or of blue spruce, and silvered seed pods of interesting shape, such as honesty, Siberian iris, gas plant, the annual grass *Briza maxima*, Oriental poppy, mallow, globe thistle, *Centaurea macrocephala*, peony, flax, and day-lily (*Hemerocallis*); and among the wild things, the fronds of the sensitive fern, hardhack, and button bush. Clippings of the golden juniper or the golden cypress produce a striking effect with gilded rubberized ribbon or bells.

Sprays are made more quickly than wreaths and are very attractive; and ropings can often be used to great advantage. Study your doorway and use the type of decoration that lends itself best to the design. Watch the proportions and never make the mistake of overdoing the trimming.

Oats, rye, wheat, barley, and broom-

corn are lovely, especially when arranged with ears of red corn. The tiny red ears of the strawberry popcorn make excellent trimming for a wreath when combined with the reddish leaves of leucothoe or barberry. Swags of grains, and red dock (gathered at haying time), with strings of old-fashioned sleigh bells, are especially suitable in the country.

Simple pine spray with frosted cones



CHOOSE INTERESTING MATERIAL

Elizabeth B. Merriam

GONE are the days of ground pine and laurel ropings, desert holly and filched bayberry, for Christmas decorations. These materials are on the conservation list, and should be left to prosper in their native haunts. Hundreds of varieties of other greens are being commercially grown to bedeck our houses at this festive season. Whether we plan the tiniest gay boutonniere or miles of the most elaborate ropings, many kinds of shrubs and trees with their fruits may be combined to achieve delightful results.

Fruits in the markets are especially interesting in December. These may be shellacked and wired, and used in wreaths, sprays, or arrangements in their natural

colors; or may be gilded or painted. Combinations of limes, lemons, pineapples, and winter pears make not only beautiful table arrangements, but (carefully wired and shellacked) may be used out of doors in all but subzero weather. Lady apples (those small yellow and red ones), large Baldwins, and the many kinds between, all add color and warmth of welcome at this time of the year. Kumquats, oranges, and persimmons add their bit to the orange-reds. Nuts may be dipped in gold or silver paint and wired; cranberries shellacked; and paulownia buds with their velvety softness used in their natural state, while the dark seed pods may be bronzed or gilded for best effect—as may sycamore balls, cat-tails and rushes, and marsh grasses.

Wreath of balsam fir and natural fruit



MAKE THE WREATHS AND GARLANDS

Isabel Zucker

THE wisest gardeners purposely postpone pruning and shaping of evergreens until just before the Christmas season in order to use the clippings for holiday decorations. All the cone-bearing evergreens have their uses. Pine, for instance, is a first-rate material for trimming decorations made from flatter evergreens; or a single branch may be used alone. Spruce is also good for trimming. Balsam, either round or flat, makes the best decorations for indoors as it does not readily drop its needles.

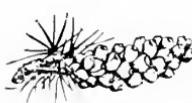
Arbor-vitae and cedar (arbor-vitae is often called cedar commercially) make beautiful table decorations because of the exquisite leaf pattern against the table-cloth. A single spray of Pfitzer's juniper is perfect.

There are two types of make-up used for holiday decorations. A mossed base is suitable for table centerpieces, Della Robbia wreaths, and cone wreaths. Dried sphagnum moss is soaked in water, then wrung out with the hands, and piled firmly on heavy corrugated cardboard. For a large centerpiece the pile should be 3 inches thick in the center, tapering to an inch at the border. The moss is then bound to the cardboard with green twine. Arbor-vitae is the most effective material to use, but balsam is good. Pieces 8 to 10 inches long are stuck into

the mossed mound so as to make an even border around the base. Shorter pieces are put in a second row an inch higher, and still shorter ones in a third ring. For trimming, heads of teazles may be added, or milkweed pods, winterberry, bayberry, pine cones, dried sea lavender, or artemisia.

The second type of make-up, used for a different type of wreath or for roping, has a wire or rope base. A wreath may be made on a wire ring or on a piece of flexible vine such as honeysuckle, tied into a circle. Three or four evergreen tips are held together in the shape of a fan; a succession of fans is bound to the frame with green twine in such a way that each one covers the base of the one before it. The same kinds of trimming materials mentioned before may be used for wreaths. If cones are used, put a wire around each one between the scales near the base and twist it close to the cone; use the ends of the wire to attach the cone to the ring.

To make a garland or roping, tie a soft, flexible clothesline to a door knob; and place a small table in front of the door to take the weight of the garland. Fans are made, as for a wreath; but four fans are placed around the rope at the same point so that it is completely and symmetrically covered. Roping may be hung as a swag over windows, mantel, or fireplace, or used to outline a door.





Doorway with garland and wreath of evergreens and natural fruit

DECK THE HEARTH

Percy I. Merry and
Ruth P. Merry

THE decoration of the mantel may be formal or informal. An informal arrangement may be made with a combination of evergreen branches, cones, candles with low wooden holders, several miniature deer, and absorbent cotton banked to simulate snow. Begin at the left with a good-sized branch of fir or other evergreen, placing it slightly on a slant toward the center. Fill in the sides with smaller pieces, working toward the center and a little beyond, since the arrangement is to have asymmetrical balance. At the right side, place a much smaller piece, slanting toward the center, with a few more small branches. Put the deer in the center, facing the left. In a few well-chosen spots, insert large cones, singly, or small cones in groups of three. Place the candles several inches from the ends of the mantel, the holders partly covered by the green branches.

A more formal composition may be made by using branches of blue spruce, two candle holders of wood, painted gold and holding three candles each, a circular Madonna reproduction, and a wreath of small gold cones. The picture is hung over the center of the mantel, and the candle holders placed on each side of it.

If one has a specimen of the soft, fine, blue-green moss *retinospora*, it is possible to make an entirely different type of decoration, suitable for a small mantel and more modern in feeling than any of the former compositions. A round silver blown-glass bowl about six inches in diameter is placed slightly off center, to the left, with a branch of *retinospora*, using the Hogarth line of beauty for the design. A silver blown-glass deer is placed at one side, facing the arrangement; and a blue candle in a silver holder at either end. This same arrangement can be used on the dining table or the buffet, where it is most effective on a long reflector.

Mantel decoration of blue spruce and compact cone wreath framing Madonna picture

Author photo



HAVE YOU READ THESE?

A SELECTED LIST OF RECENT NON-TECHNICAL BOOKS, MAGAZINE ARTICLES, AND EXPERIMENT STATION BULLETINS FROM ALL SECTIONS OF THE COUNTRY

Several of the articles in the following list would have been condensed or republished in full, had space permitted

General

PLANT GROWTH, by L. Edwin Yocum. Published by The Jaques Cattell Press, Lancaster, Pa., 1945. 225 pages. \$3.

Not a text book. For the layman, an explanation of the relationship of plants to their environment. What to do in caring for plants, and the reasons for doing it.

GROUNDS FOR LIVING, edited by Richard B. Farnham and Van Wie Ingman. Published by Rutgers University Press, New Brunswick, N. J., 1946. 334 pages. \$2.50.

A book giving practical information on the development of the home grounds. Chapters by authorities on roses, vegetables, fruits, and soil, as well as outdoor fireplaces and fences.

AROUND THE GARDEN, by Dorothy H. Jenkins. Published by M. Barrows and Co., Inc., New York, 1946. 256 pages. \$2.50.

A week-by-week chronicle for a year of garden work and pleasure.

THE ENCYCLOPEDIA OF TREES, SHRUBS, VINES, AND LAWNS, by Albert E. Wilkinson. Published by The Blakiston Co., Philadelphia, Pa., 1946. 486 pages. \$1.

This book for the practical gardener has an alphabetical list of common and scientific names of trees, shrubs, and vines, with descriptions; also chapters on the home garden, selection and use of woody plants, lawns, hedges, soils and fertilizers, pruning, insect pests and diseases and their control, propagation of woody plants, and the use of trees along streets and roads.

GARDENING FOR HEALTH AND HAPPINESS, by Hugh Findlay. Published by the author, Madison, N. J., 1946. 59 pages. 75 cents.

A book describing new gardening techniques developed by the author for the visually handicapped, with illustrations of the new tools.

PROPAGATION OF PLANTS, by M. G. Kains and L. M. McQuesten. Published by Orange Judd Publishing Co., Inc., New York, 1945. 638 pages. \$3.50.

A complete guide for amateur and professional growers of plants by seeds, layers, grafting, and budding, with chapters on nursery and greenhouse management. Tells how and why.

PLANT PROPAGATION UNDER FLUORESCENT LAMPS, by V. T. Stoutermyer and Albert W. Close. United States Department of Agriculture, Bureau of Plant Industry (unnumbered processed publication), March, 1946. 5 pages.

Directions for the construction and use of a case in which to start seedlings or root cuttings under artificial light; designed for amateur or professional use.

THE FUNDAMENTALS OF PLANT HYBRIDIZING, by Lyman N. White. In *The Home Garden*, Nov. and Dec., 1945; and Jan., 1946. 6 pages in each issue.

A down-to-earth article giving the fundamental rules for obtaining new plants.

THE GARDEN CALENDAR FOR 1947, by Helen Van Pelt Wilson. Published by M. Barrows and Co., Inc., New York, 1946. 117 pages. \$1.

An engagement calendar, with a garden quotation and a full-page illustration for each week.

Landscaping

DRIVEWAYS AND SIDEWALKS, by Donald J. Bushey. Cornell University (Ithaca, N. Y.) Extension Bulletin 693, March, 1946. 6 pages.

A bulletin describing the locating and constructing of these features on the home grounds, and their treatment in landscape planting.

DEAR AMERICAN HOME, by Alfred E. Thayer and others. In *The American Home*, Sept., 1946. 11 pages.

Illustrates a small G.I. home, with six plans for landscaping it, each in a different section of the United States.

LANDSCAPING THE FARM-STEAD, by Leon C. Snyder. University of Minnesota (St. Paul) Extension Bulletin 250, March, 1946. 23 pages.

A bulletin giving information on planning, planting, and maintaining the home grounds of the farm.

TOMORROW'S GARDEN, by E. L. D. Seymour. In *The American Home*, Jan., 1946. 2 pages.

An article telling of some of the ideas and plans that may be found in garden designs in the future.

Soils and Fertilizers

PAY DIRT, by J. I. Rodale. Published by The Devin-Adair Co., New York, 1946. 242 pages. \$3.

The case for more extensive use of composts.

PRODUCTION OF ARTIFICIAL MANURE, by F. B. Smith and G. D. Thornton. Florida (Gainesville) Agricultural Experiment Station Bulletin 415, Sept., 1945. 16 pages.

A report on experiments in composting organic matter.

VERMICULITE, by R. Milton Carleton. In *Flower Grower*, Feb., 1946. 4 pages.

An outline of experiments by United States Department of Agriculture in rooting cuttings and growing seedlings, using exfoliated mica, a material that



can hold soluble fertilizers and is free from fungi, bacteria, and other matter injurious to seedlings.

WHAT, WHEN, AND HOW TO FEED YOUR PLANTS, by F. F. Rockwell. In *The Home Garden*, April, 1946. 7 pages.

Concise information on materials for soil improvement; and how and when to apply fertilizer to fruits, vegetables, flowers, shrubs, etc.

Plant Pests and their Control



THE GARDENER'S BUG BOOK, by Cynthia Westcott. Published by The American Garden Guild, Inc., and Doubleday & Co., Inc., New York, 1946. 590 pages. \$4.95.

In clear and simple form for the layman, a complete and accurate manual on insect pests and their control, based on professional experience. Colored illustrations of over 100 life histories.

CANKER STAIN OF PLANE-TREES, by James M. Walter. United States Department of Agriculture (Washington, D. C.) Circular 742, Jan., 1946. 12 pages.

A circular describing this disease, and telling of its importance, its hosts, how it is spread to healthy trees, and the control.

THE LILY WEEVIL, A POTENTIALLY SERIOUS PEST IN THE PACIFIC NORTHWEST, by Charles F. Doucette and Randall Latta. United States Department of Agriculture (Washington, D. C.) Circular 746, April, 1946. 24 pages.

A description of the insect, its distribution, and how it grows and spreads; with recommendations for field control.

NEW BUG KILLERS, by Louis Pyenson. In *Flower Grower*, March, 1946. 3 pages.

A table of plant pests and their controls, with comments on the amount of DDT in the killers.

JAPANESE BEETLE ABUNDANCE AND INJURY ON SWEET CORN, by L. A. Carruth, L. M. Bartlett, and J. A. Adams. New York State Agricultural Experiment Station (Geneva) Bulletin 715, March, 1946. 15 pages.

A summary of observations on this pest, and possible control measures.

DUTCH ELM DISEASE CONTROL, by D. S. Welch, W. H. Rankin, and P. A. Readio. Cornell University (Ithaca, N. Y.) Extension Bulletin 687, Dec., 1945. 15 pages.

This bulletin tells the extent of the disease, how to recognize an affected tree, how the fungus is spread, and the controls possible; and gives suggestions for general care to induce healthy growth of elms.

DUST TREATMENTS FOR VEGETABLE SEED, by W. B. Tisdale, A. N. Brooks, and G. R. Townsend. University of Florida (Gainesville) Agricultural Experiment Station Bulletin 413, Aug., 1945. 28 pages.

A report on seed treatment to prevent damping off of seedlings in greenhouse and field.

LONGER LIFE, MORE BEAUTY FROM YOUR TREES, by Emery Howard. In *Better Homes & Gardens*, Sept., 1946. 2 pages.

Recommendations for reducing the damage to trees by diseases, insects, gas, drought, starvation, and mechanical injury.

AZALEA PETAL BLIGHT, by Cynthia Westcott. In *The Home Garden*, Feb., 1946. 4 pages.

This article gives results of experiments on spraying buds with dithane to prevent the disease.

Pest Plants

WEEDS OF LAWN AND GARDEN, by John Milton Fogg, Jr. Published by University of Pennsylvania Press, Philadelphia, Pa., 1945. 215 pages. \$2.50.

An illustrated manual, designed to aid the home gardener to identify weeds quickly.

WEED INVESTIGATIONS, by Clair A. Brown and W. H. Carter. Louisiana State University (Baton Rouge) Agricultural Experiment Station Bulletin 402, Feb., 1946. 23 pages.

A report of research on control of southern weeds mechanically and with chemical and hormone weed killers.



POISON IVY, POISON OAK, AND POISON SUMAC, by Donald M. Crooks. United States Department of Agriculture (Washington, D. C.) Farmers' Bulletin 1972, Aug., 1945. 31 pages.

A bulletin illustrating and describing these plants, and telling of their distribution, precautions against and treat-

ment of poisoning, and eradication of the plants.

ERADICATION OF CERTAIN MAINE WEEDS, AN IMPORTANT STEP IN CONTROL OF POTATO DISEASES SPREAD BY APHIDS, by G. P. Steinbauer and F. M. Steinmetz. University of Maine (Orono) Agricultural Experiment Station Miscellaneous Publication 602, July, 1945. 23 pages (3 pages on weed trees).

tural Experiment Station Miscellaneous Publication 602, July, 1945. 23 pages (3 pages on weed trees).

A bulletin giving methods of killing weeds, and suggestions on how and when to apply various chemicals. The section on eradicating the wild plum is of special interest to gardeners.

Hormones for Selective Weed Killing and Seedless Fruit Production

WE "FIXED" OUR TOMATOES, by R. A. Diettert. In *Flower Grower*, July, 1946. 1 page.

A story of spraying tomato flowers with hormones to hasten the setting of fruit and reduce the number of seeds.

DANDELION CONTROL WITH 2,4-D, by Dayton Klingman. University of Wyoming (Laramie) Agricultural Experiment Station Bulletin 274, Jan., 1946. 10 pages.

A report on experimental work on lawns.

2,4-D AND WEED-FREE LAWNS, by A. M. S. Pridham and J. F. Cornman. Cornell University (Ithaca, N. Y.) Extension Bulletin 698. May, 1946. 4 pages.

A circular of instructions and precautions.

NEW SPRAY KILLS DANDELIONS—DOESN'T HURT GRASS, by R. Milton Carleton. In *Better Homes & Gardens*, Feb., 1946. 1 page.



An article telling about 2,4-D and its use on lawns for weed control.

A TROPICAL-WEED KILLER, by David G. White and Aida G. Villafañe. In *Agriculture in the Americas*, Aug., 1946. 3 pages.

An article describing the effect of 2,4-D on several weeds of the southern States and the tropics.

DESTROYING LAWN WEEDS WITH 2,4-D, by Gilbert H. Ahlgren and Herbert R. Cox. New Jersey (New Brunswick) Agricultural Experiment Station Bulletin 725, April, 1946. 9 pages.

A report on experimental work and a summary of the results; not written in technical language.

Trees, Shrubs, Vines



TREES, SHRUBS, AND VINES FOR THE NORTHEASTERN UNITED STATES, by George Graves. Published by Oxford University Press, New York, 1945. 267 pages. \$3.

A handbook, with a short description of each plant mentioned. Suggestions for culture, propagation, pruning, and pest control are included where these are important.

THE FRIENDLY EVERGREENS, by L. L. Kumlien. Published by D. Hill Nursery Co., Dundee, Ill., 1946. 237 pages. \$6.

An easily read, comprehensive book on the propagation and cultivation of evergreens.

GARDENING WITH SHRUBS AND SMALL FLOWERING TREES, by Mary Deputy Lamson. Published by M. Barrows and Co., Inc., New York, 1946. 295 pages. \$2.75.

An illustrated book for the homeowner by a professional landscape architect. A complete guide to purchasing, upkeep, pruning, and transplanting; with lists of shrubs for flowers, fruit, foliage, fragrance, and winter color.

HEDGES FOR NORTH AMERICA, by Donald Wyman. In *The National Horticultural Magazine*, July, 1946. 20 pages.

A very detailed discussion of the many trees and shrubs that may be trimmed and trained for dense hedges; with cultural directions.

GROWING GARDEN ROSES, by E. C. Volz, Iowa State College (Ames) Agricultural Experiment Station Bulletin P 76, Oct., 1945. 26 pages.

A bulletin on culture as it applies to Iowa and similar regions.



HOW TO CHOOSE A GOOD TREE, by Montague Free. In *The Home Garden*, Aug., 1946. 7 pages.

The advantages of nursery stock and the good and bad points to watch for are clearly outlined in this article.

NEW SHRUBS FROM OLD, by Montague Free. In *The Home Garden*, July, 1946. 9 pages.

A concise picture article on taking cuttings from favorite shrubs, with notes on rooting mediums.

THE HANDBOOK OF RHODO-DENDRONS, written and published by The Arboretum Foundation, Seattle, Wash., 1946. 198 pages. \$5.

A reference book on selecting, planting, and caring for these plants.

BAMBOOS FOR NORTHERN GARDENS, by Robert A. Young. In *Arnoldia*, June 28, 1946. 17 pages.

A discussion of the hardiness of certain species of bamboos, with descriptions and illustrations.

NEED A VINE?, by J. Evans Hendricks. In *Better Homes & Gardens*, July, 1946. 2 pages.

Illustrations and lists of vines suitable for many garden purposes.

Annuals, Perennials, Bulbs

PERENNIALS PREFERRED, by Helen Van Pelt Wilson. Published by M. Barrows and Co., Inc., New York, 1945. 256 pages. \$2.75.

The essentials of growing these plants are presented in an easy-to-follow style in this interesting book.

GARDEN LILIES, by Alan and Esther Macneil. Published by Oxford University Press, New York, 1946. 226 pages. \$3.50.

A handbook on planning, planting and caring for these plants.

HOW TO PLANT GOOD LILIES, by George L. Slate. In *The Home Garden*, Nov., 1945. 4 pages.

This article explains that the most important factor in growing lilies is the bulb with its roots; next, the site.

BULBS OFF THE BEATEN TRACK, by Allen H. Wood, Jr. In *The Home Garden*, Oct., 1945. 3 pages.

A short description of the hardy bulbs that are not, but could be, grown in gardens.

HOW WELL DO YOU KNOW THE LITTLE IRISES?, by George M. Reed. In *The Home Garden*, Aug., 1946. 5 pages.

The many small iris varieties are well described and profusely illustrated in this authoritative article.

JAPANESE IRIS, by George M. Reed. In *Flower Grower*, July, 1946. 3 pages.

A well-illustrated article, with descriptions of various types of Japanese iris and useful information on their culture.

A KEY TO THE CULTIVATED HOSTAS, by Edgar T. Wherry. In *The National Horticultural Magazine*, July, 1946. 4 pages.

A short article with working key to ten varieties of the plants sometimes known as *Funkias*.

HOW TO GROW HEALTHY CHRYSANTHEMUMS, by A. W. Dimock. In *Flower Grower*, April, 1946. 4 pages.

A schedule of disease control, with sketches showing the progress of disease in the plants.

BLEEDING-HEART, by Fred M. Abbey. In *Flower Grower*, April, 1946. 2 pages.

A story of the author's experience, with suggestions for growing this plant.

SNAPDRAGONS, by Charles Weddle. In *Flower Grower*, Feb., 1946. 3 pages.

A discussion of the culture of these plants, their pests, and their future development as garden flowers. A classification of varieties is helpful in making a selection.

SAVORY HERBS: CULTURE AND USE, by M. S. Lowman. United States Department of Agriculture (Washington, D. C.) Farmers' Bulletin 1977. May, 1946. 34 pages.

A bulletin on culture, classification, harvesting and curing, and culinary uses of 25 most important herbs.

Lawns

PLANTING AND CARING FOR THE LAWN, by Gilbert H. Ahlgren. New Jersey (New Brunswick) Agricultural Experiment Station Bulletin 724, March, 1946. 31 pages.

This well-illustrated bulletin deals with the steps in making a lawn, its care, and insect and disease control; also repair, mulching, and grass on terraces.

THE HOME LAWN, by H. L. Lantz, L. C. Grove, and E. P. Sylvester. Iowa State College (Ames) Agricultural Experiment Station Bulletin P 80. April, 1946. 18 pages.

A bulletin on the making and care of a lawn.

YOU KNOW THESE LAWN RULES, BUT DO YOU PRACTICE THEM?, by Christopher Brown. In *House Beautiful*, June, 1946. 2 pages.

A concrete and stimulating article.

YOUR LAWN, by Victor H. Ries. In *Better Homes & Gardens*, March, 1946. 2 pages.

This article tells how to prepare and care for a lawn. Sketches illustrate some of the important steps.

Native Plants

GUIDE TO SOUTHERN TREES, by E. S. Harrar and J. G. Harrar. Published by Whittlesey House, McGraw-Hill Co., Inc., New York, 1945. 712 pages. \$4.50.

An attractive manual of botanical, ecological, and economic facts about trees native to the States south of the Mason-Dixon Line.

WILD FLOWERS OF MISSISSIPPI, by Ferris S. Batson and George W. Johnston. Mississippi State College Agricultural Experiment Station Bulletin 417, June, 1945. 60 pages.

A bulletin written to encourage the protection, care, and garden use of over 60 native plants of the State. Descriptions, illustrations, and habitats.

THE CONIFERS OF MAINE, by Fay Hyland. Maine (Orono) Extension Bulletin 345, June, 1946. 20 pages.

A bulletin describing and illustrating the native narrow-leaf evergreens of Maine, with a key for their identification; with notes on occurrence, uses, and most common pests. Useful in any part of northeastern North America.



Fruits and Vegetables



DWARF FRUIT TREES FOR HOME GARDENS, by I. B. Lucas. Published by A. T. DeLaMare Co., Inc., New York, 1946. 123 pages. \$3.

A book based on experience; explaining why dwarf trees are better, and how to take care of them.

GROWING TREE FRUITS FOR HOME USE, by Wesley P. Judkins. In Ohio (Wooster) Agricultural Experiment Station Bimonthly Bulletin, Jan.-Feb., 1946. 16 pages.

An article on selection of varieties, soils, planning and planting, pest control, pruning, and general culture, as applied to back yards or small home orchards.

BREEDING BETTER VEGETABLES FOR THE SOUTH, by C. A. Magoon and others. United States Department of Agriculture (Washington, D. C.) Miscellaneous Publication 578, Oct., 1945. 35 pages.

A bulletin describing the work of

the United States Regional Vegetable Breeding Laboratory at Charleston, S. C.

BREEDING POTATOES RESISTANT TO DISEASE, by F. J. Stevenson. In *The National Horticultural Magazine*, Jan., 1946. 11 pages.

An article telling about the introduction and development of the potato, with special emphasis on the breeding of disease-resistant varieties.

THE VEGETABLE GARDEN, by Arthur J. Pratt, R. W. Leiby, Charles Chupp, and R. D. Sweet. Cornell University (Ithaca, N. Y.) Extension Bulletin 696, March, 1946. 67 pages.

A complete guide, for New York State, on planning, preparing, and planting a vegetable garden, with a discussion of garden practices, pest control, and crop rotation; and descriptions of individual kinds of vegetables and their requirements.

BACK-YARD BLUEBERRIES, by George L. Slate. In *The Home Garden*, April, 1946. 3 pages.

The best varieties for home growing are suggested in this article; also the best cultural methods.

Greenhouses

GREENHOUSE GARDENING FOR EVERYONE, by Ernest Chabot. Published by M. Barrows and Co., New York, 1946. 266 pages. \$3.

A book for those having home greenhouses. Information on construction and operation, including all of the modern automatic devices. Cultural information on flowers, foliage plants,



and vegetables, with a very useful calendar of greenhouse operations.

House Plants



GERANIUMS—PELARGONIUMS FOR WINDOWS AND GARDENS, by Helen Van Pelt Wilson. Published by M. Barrows and Co., New York, 1946. 248 pages. \$2.75.

A book on geraniums and their culture and use. A real help to the gardener with a special hobby.

SUCCESS WITH YOUR HOUSE PLANTS, by L. C. Grove. In *Better*

Homes & Gardens, November, 1945. 3 pages.

An article full of useful information.

102 HOUSE PLANTS THAT REALLY BLOOM, by Montague Free. In *The Home Garden*, November, 1945. 8 pages.

A master selection chart of plants for indoor gardeners, by an expert.

ALL ABOUT HOUSE PLANTS, by Montague Free. Published by The American Garden Guild, Inc., New York, 1946. 345 pages. \$3.50.

A complete guidebook to indoor gardening: selecting plants, and their culture, care, and propagation.

Flower Arrangement

THE HOME GARDENER'S READING COURSE IN FLOWER ARRANGEMENT, by F. F. Rockwell and Esther C. Grayson. In *The Home Garden*, May through Nov., 1946. 5 to 8 pages in each issue.

A series of articles giving the principles of arrangement, with sketches showing right and wrong placing of bouquets.



Conservation

FOOD OR FAMINE: THE CHALLENGE OF EROSION, by Ward Shepard. Published by Macmillan Co., New York, 1946. 225 pages. \$3.

This book advocates continent-wide organization of land management districts to take care of farms scientifically; also proper control of the watersheds to prevent floods.

THE LAND RENEWED, by William R. Van Dersal and Edward H. Graham. Published by Oxford University Press, New York, 1946. 110 pages. \$2.

This easily read book tells what has been done to the soil on renewed farms.

FOREST PLANTING IN CONNECTICUT, by N. W. Hosley and A. R. Kienholz. University of Connecticut (Storrs) Extension Bulletin 375, Nov., 1945. 12 pages.

A bulletin on the selection, planting, and care of forest trees in Connecticut or under similar conditions.

TREES FOR REFORESTATION IN INDIANA, by Daniel DenUyl. Purdue University (Lafayette) Agricultural Experiment Station Circular 306, 1945. 13 pages.

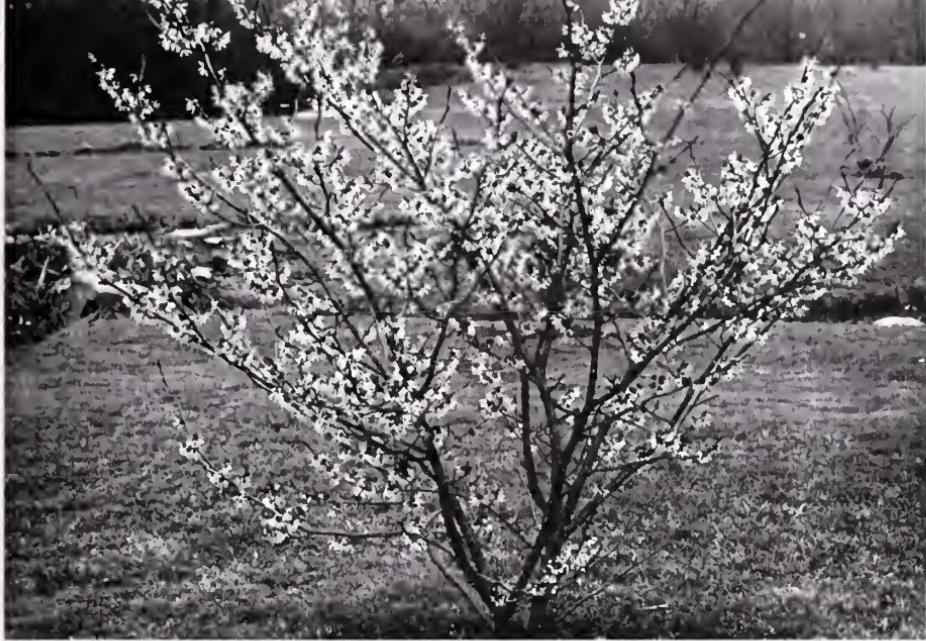
This circular tells where and what to plant for reforestation on non-agricultural lands; written for Indiana, but suitable for similar conditions elsewhere.

HOW TO PLAN AND MAINTAIN A MEMORIAL FOREST. In *American Forests*, Nov., 1945. 6 pages.

This article gives practical information for those who wish to undertake such work.

THE CONTINENTAL JOB, by Wallace G. Schwass. In *National Parks Magazine*, Jan.–March, 1946. 6 pages.

This article tells of the need of acquiring privately owned lands for the establishment of parks; and of the need of establishing uniform regulations.



Japanese witch-hazel in bloom

WITHIN THE BROOKLYN BOTANIC GARDEN

SHRUBS FLOWERING LATE IN 1946

Our native witch-hazel (*Hamamelis virginiana*) is the last shrub to flower in the fall, coming out in October or November. The other kinds bloom in January, February, or March, and are the first flowering shrubs of the new year.

Witch-hazels are excellent shrubs to use in groups or in border plantings. Their striking fall foliage color of bright yellow to orange makes them very effective; but the chief garden interest is in their "out of season" bloom. The fine twisted petals are a bright to golden yellow, and are especially striking when seen against the snow. Witch-hazels are easily grown and generally do best in moist soil, although the Japanese one (*Hamamelis japonica*) will grow in drier locations.

This fall a great variety of our early spring flowering shrubs and trees have been in bloom. There has been enough cold weather to break the dormancy of some of these flower buds; and this has been followed by weather warm enough

to permit flowering. It is not uncommon to find a few forsythia flowers in the fall; but this year several plants in the Garden were almost as showy as they were in the spring. Japanese quince is another shrub that occasionally has a few fall flowers; but here again, some of the plants this year had almost a full spring display. Other plants which produced some fall flowers were viburnum and lilac daphne. Even the rhododendron had a few buds showing color on Thanksgiving Day. The flower buds on all these plants begin to form in the summer, and so they are fully developed in form by the time the leaves drop. They have only to expand in size when they open.

Under normal conditions most of the buds that opened this fall would have remained dormant until next spring. And so the spring display of some of these plants will be correspondingly reduced.

CONRAD B. LINK

**AN OPEN LETTER FROM THE RETIRING PRESIDENT OF
THE GARDEN AUXILIARY TO CLUBS WHICH ARE
MEMBERS OF THE GARDEN**

November 20, 1946

My dear Mrs. ———:

At this time of year most Garden Clubs are planning their programs for the year. As President of the ——— Garden Club, I wonder if it has occurred to you to have one of your meetings at the Garden, with the annual lecture there to which you are entitled as a member of the Garden.

It is a place you can well be proud of, and it would be of great interest to all your members. For besides the very beautiful grounds, which include a gorgeous rose garden, wild flower garden, herb garden, and rock garden, to mention only a few, the work of the Garden staff would, with its new research work, be a subject modern in its aspect and one all garden-minded people would appreciate.

We now have a small but well-equipped kitchen, where you can make coffee and serve a simple luncheon; so you could come in the morning, visit the Garden with a curator, have a box luncheon, and

a lecture; or the same program could be given in the afternoon. This would enable you to have a lecture by one of our leading people. They are too busy to go out to give lectures, so this would mean an opportunity to hear such speakers as Dr. Avery, Dr. Graves, Dr. Link, Miss Miner, and Miss Hess. On the enclosed separate sheet you will find directions showing how easy it is to reach us.

Any time of the year is good at the Garden. In winter, with our attractive greenhouses, we could perhaps have a talk on dish gardens or house plants, which would be of interest to many.

To give you just what you want we must have your request at least two to four weeks in advance. Make arrangements for coming by writing to our Dr. Arthur H. Graves.

You may be sure of our appreciation of your continued interest and support.

Cordially yours,
(Signed) Elizabeth Parker, President
(Mrs. John C.)

CLUBS THAT ARE NOT MEMBERS OF THE GARDEN may be interested in the above letter; for they also are invited to visit the Garden.



NEW RESEARCH

New appointments will appear in full in the Annual Report for 1945-1946. Meanwhile, it should be announced that a new program of research is in progress. Dr. Lindsay M. Black has been appointed Curator of Plant Pathology, to succeed Dr. George M. Reed. Dr. Black comes

to the Garden from the Rockefeller Institute for Medical Research at Princeton, New Jersey. He is a student of virus diseases of plants, and is currently working with his associates on a virus-caused tumor disease of plants. A brief account of his work will appear in an early number of *Plants & Gardens*.

INDEX TO VOLUME 2

1946

*An * following a page number indicates an illustration*

- alder, catkin and flowers 10*
- Allen, Nellie B. 58
- American Forests**, article from 205
- American Home**, article from 208
- American Nurseryman**, articles, 200, 230
annuals 58
articles on 247
- antibiotics 217, 219
- Arboretum Bulletin**, University of Washington, article from 212
- arboretum, hemlock 56
- arbutus, trailing 141*
- aster, New England 145*
- Avery, George S., Jr. 3, 67, 117, 131, 195
- bargain, biggest you can find 226
- Barnes, Laura L. 39
- bee-balm No. 3 color*
- beech
 pollen-bearing catkin 12*
 weeping, Flushing, N. Y. 41*
- Biernan, Arthur 64
- birch
 gray No. 1 color*
 white, catkin shedding pollen 11*
- Bird, Robert S. 220
- black-eyed Susan No. 3 color*
- Black, Lindsay M. 252
- bladder-nut 147*
- bleeding-heart, wild No. 3 color*
- Boerner, Eugene S. 85
- bog-laurel 175*
- books, magazine articles, bulletins, list of recent 243
- boxwood leaf miner
 end of 232
 pupae 233*
- Brigham, Dorcas 112
- Bromley, Stanley W. 48
- Brooklyn Botanic Garden
 activities, educational 63*
 birds (feathered friends) 64*
 Children's Garden, harvest time 190*
 community planting for civic beauty 121
 exhibit at New York Flower Show 126*, 127*
- fellowship, Ellen Eddy Shaw 61
- flower arrangement course 63
- Forsythia
- Brooklyn's official flower, message of 61
- Day, April 10, 1946 128
- Gate, Tuch, dedication of 128
- hay fever control, working with public officials on 191
- house plants (course) 63*
- letter to member clubs from Auxiliary President 252
- research, new 252
- retirement plan for Garden employees 192
- shrubs flowering late in 1946 251*
- testing nameless flowers (All America Flower Seed Selections) 192
- Brownell, Walter and Josephine 93
- build, before you 208*
- bulbs, books etc. on 247
- butterfly-weed 167*
- Calochortus* 170*, 173*
- Carder, Ellen B. 237
- cardinal-flower No. 3 color*
- Carleton, R. Milton 215
- Carroll, Michalena LeFrere 191
- Carson, John B. 100
- cherry, early flowering 1*, 65*, 129*, 193*
 chestnut
 Japanese-American hybrid 203*
 trees, making new 202*

- Christmas decorations 237
 hearth 242*
 house 237
 material 239*
 spray 238*
 tree 237
 wreaths, garlands 236*, 240, 241*
- Collier's**, article from 210
- columbine, No. 3 color*, 179*
- community
 planting for civic beauty 121
 projects, how to use your newspapers effectively for 124
- conservation
 books etc. on 250
 hints 169
 of wild flowers in New England 155
 (we need wilderness) 196
- coral-root 150*
- crab-apples
 Arnold, fruit and foliage 43*
 Carmine No. 1 color*
 ornamental, for flower and fruit 42
- cranberry-bush No. 3, cover*
- daffodil 181*, 184*
 selections, American 180
- Darling, Janet 4
- Dawson, Ray F. 119
- daylilies, how to give a perfect setting 234*
- DDT
 does (it) stimulate plants? 199
 how to use 205
 spraying 205*, 206*, 207*
- Director's letter 3, 67, 131, 195
- dogs-tooth violet 144*
- dogwood 27*, 40*
- Doney, Charles F. 15
- Donnelly, Thomas A. 192
- dove-tree, foliage, flowers 39*
- Downer, Henry E. 27
- earthworms 215
- elm
 bark beetles and galleries 221*, 223*
 cross section of diseased twig 220*
 flowers 13*
 trees, disease taking increasing toll of 220
- embryo culture in rose breeding 111*
- Ewing, Gardiner 226
- fern
 broad beech 161*
 harts-tongue 158*
 New York 162*
- fertilizers, books etc. on 244
- firs, alpine, Glacier National Park 197*
- flower arrangement, articles on 250
- Flower Grower**, articles from 232, 234
- forget-me-not No. 3 color*
- Forsythia 62*
 Brooklyn's official flower, message of 61 Day, in Brooklyn 128
- Fortune**, article from 217
- French River, Ontario 198*
- fruit drop control by hormones 127*
- fruits, books etc. on 249
- fungus, streptomycin-producing 219*
- garden
 city wild flower 174*
 (Lilliputian landscapes) 132*, 134*
 plan 5*, 6*, 70*, 133*
 small, city 4*
 trees for 27*
 wild 150
 year-round 68, 69*
- gentian 157*, 168*
- Gorlin, Philip 187
- Graff, Jan de 180
- grafting
 new information from an old practice 119
- tobacco and tomato 120*
- gramicidin crystals 218*
- Graves, Arthur Harmount 202
- greenhouse
 bench, automatically watered 214*
 book on 249
 care of the small 212*
 motor for automatic ventilation 213*
- ground covers under trees 161
- Halesia carolina* No. 1 color*
 Hall, A. G. 205
- hawkweed, orange No. 3 color*
- hawthorn 146*
- hemlock No. 1 color*
 arboretum 56*, 57*
- Hershey, John W. 30
- Hess, Elizabeth 190
- H-F Day (hay fever) 228

- Hirtl, Leo 210
Home Garden, The, article from 215
 hormones
 and horticulture at the New York Flower Show 126*
 bulletins and articles on 246
House Beautiful, article from 226
 house plants
 at a west window 63*
 books and articles on 250
 ice after the storm 194*
 Jack-in-the-pulpit 151*
 Jenkins
 Charles F. 56
 Dorothy H. 124
 Johnson, Minnie May 144
 Keays, Ethelyn E. 98
 Kelly, Sally 126
 lady-slipper 137*, No. 3 color*
 Lammerts, Walter W. 111
 Lamson, Mary Deputy 68
 landscapes, Lilliputian 132*
 landscaping, bulletins, articles 244
 lawns
 bulletins, articles on 248
 trees for 26*
 layout of the small place 4*, 68*, 132*
Lilium Willmottiac 186*
 some hybrids of 185*
 lily, wild 136*, No. 3 color*
 Link, Conrad B. 192, 251
Magnolia virginiana No. 1 color*
Malus atrosanguinica No. 1 color*
 manures or chemicals? 215
 maple, red, flowers 14*
 Mariposa-tulip 173*
 marsh-marigold No. 3 color*
 Mattoon, H. Gleason 50
 May-apple 167*
 McFarland, J. Horace 77
 medicine from earth 217
 Merriam, Elizabeth B. 239
 Merry, Percy I. and Ruth P. 242
 narcissus, poets 182*
National Parks Magazine, article, 196
 native plants, books, articles on 248
 newspapers, how to use effectively in community projects 124
New Yorker, The, article from 228
New York Herald Tribune, article, 220
 nursery stock 226
 oak
 pollen-bearing catkins 12*
 white 2*
 Olson, Sigurd 196
 orchis 152*, 169*
 Parker, Elizabeth (Mrs. John C.) 252
 Paul, Arthur F. 44
 Peck, Frederick W. G. 132
 penicillin 217
 perennials, books etc. on 247
 periwinkle 163*
 pest plants, books etc. on 245, 246
 pests and control, books etc. on 244
 Pfister, C. Eugene 97
 Piester, E. A. 33
 pinks, wild No. 3 color*, 176*
Pinus rigida 15*
 Pirone, P. P. 208
 pitcher-plant 139*
 plane, London, 116*
 planting, civic, a post-war challenge 121
 polygala, fringed 142*
 poplar, pollen-bearing catkins 12*
 potatoes, to keep from sprouting 214
 pruning, proper and improper 48*, 49*
Prunus subhirtella 1*, 65*, 129*, 193*
 Purdy, Elmer C. 170
 Pyenson, Louis 232
 Queen Annes lace No. 3 color*
 ragweed
 circulars, posters, 187*, 188*, 189*
 Grigsby's compromise 229
 H-F Day 228*
 "Operation Ragweed" 187
 ragwort 166*
 raspberry, flowering No. 3 color*
 Reynolds, Harris A. 52
Rosa
 alba 73*
 arvensis 76*
 canina 75*

- centifolia* 74*
chinensis 75*
damascena 74*
Hugonis 81*
multiflora 72*
 var. *Cathayensis* 84*
odorata 106*
Roulettii 91*
spinosissima 83*
tomentosa 76*
turbinata 73*
Wichuraiana 80*
- rose
 as a world plant 77
 breeding, embryo culture in 111*
 California No. 2 color*
 China 111*
 climbing 78*
 double 88*
 Los Angeles 82*
 Countess Vandal No. 2 color*
 Crimson Rambler 72*
 Garden, Brooklyn Botanic Garden 66*
 garden maintenance 103
 Harrison's Yellow 105*
 layering 109*
 -mallow No. 3 color*
 Mandalay No. 2 color*
 plants pruned and unpruned 108*, 109*
 President Hoover No. 2 color*
 Rouge Mallerin No. 2 color*
 Silver Moon No. 2 color*
 species 72
 terrace and pergola 71*, 107*
 testing 97
 tree, Miss Flora Mitten No. 2 cover*
 wild 149*
- roses
 color inserts No. 2, 96-97*
 cutting 108*
 for severe climates 90
 hardy and healthy 93
 hardy enduring 87
 how to grow exhibition quality 100
 how to grow in the city 107
 in cottage garden 94*
 old 98
 old garden 79
 outstanding new 85
 over garden entrance 89*
 Rusk, Hester M. 161
- Schiff, Carl J. 115
 Seckman, Mary C. 237
 Sedum 145*
 shrubs
 books and articles on 246
 flowering late in 1946 251*
 Shull, J. Marion 234
 silk-tree, flowers and foliage 21*
 silver bell No. 1 color*
 Skinner, F. L. 185
 Smith, Gertrude M. 37, 103
 snapdragon, Giant Ruffled Tetra 59*
 soils, books etc. on 244
 Solomons-seal No. 3 color*
 speedwell 164*
 spiderwort No. 3 color*
 sprayers, 206*, 207*
 spraying
 DDT, by plane 205*
 ragweed with 2, 4-D 228*
 squirrel-corn 138*
 star-tulip 170*
 streptomycin 217
 sumac, staghorn 148*
 Svenson, Henry K. 10, 72, 174
 sweet bay No. 1 color*
- Taylor, Kathryn S. 155
 testing nameless flowers 192
 thistle No. 3 color*
 Tilley, Sidney R. 107
 tobacco, grafted with tomato 120*
 tomato, grafted with tobacco 120*
 town forest 52, 53*, 55*
 tree
 Christmas 237
 families 10
 forms 7*, 9*
 trees
 books and articles on 246
 chestnut, making new 202
 color inserts No. 1, 32-33*
 columnar, worthy of growing 230
 elm, disease taking increasing toll of
 220
 flowering 24
 for autumn and winter interest 25
 for city streets 33
 for cold climates 20
 for dry places 15
 for lawn and garden 27

for mild climates 21
for screen plantings 22
for seashore 19
for special purposes 15
for wet soil 16
ground covers under 161
healthy, how to have 50
how to prune 48*, 49*
how to transplant 44*, 45*
nut 30
safeguard, before you build 208*
small shade, for small properties 200
street, how to help 115*
to avoid on the small place 37
unusual 39
winter splendor 224*, 225*
trillium 154*
Tsuga No. 1 color*, 56*
Tuch Gate, dedication of 128
tulips in a garden 68*
turtle-head No. 3 color*

vats full of vittles 210
vegetables, books etc. on 249
Viburnum Opulus No. 3 cover*
Vick, A. F. W., Jr. 150
vines, books and articles on 246
Virginia bluebells No. 3 color*

wake-robin No. 3 color*
wall gardens 112, 113*

walnut, pollen-bearing catkins 12*
Washington thorn, fruit, foliage 28*
weed killing
 at New York Flower Show 127*
 books etc. on 245, 246
 front, recent advances on 117
Wherry, Edgar T. 135
Wieting, Carol G. 212
Wilcox, Richard S. 90
wilderness, we need 196
wild flowers
 can we hope to tame the ? 135
 color inserts 160-161*
 conservation in New England 155
 families of 143
 garden, a city 174
 how to grow for pleasure 144
 notes on 165
willows No. 1 cover*, color*; 130*
Wister, John C. 7, 87, 121
witch-hazel, Japanese 251*
woodland in the city 178*
Wright, Gertrude Albion 79
Wyman, Donald 42, 200, 230

Yankee Magazine, article from 202
yeast plants provide food and medicine
 210, 211*

Zucker, Isabel 240

BROOKLYN BOTANIC GARDEN

Scientific, Educational, and Administrative Staff

GEORGE S. AVERY, Jr., Ph.D.	Director
BEATRICE F. BEADLE	Office Assistant
RALPH CURTISS BENEDICT, Ph.D.	Investigator (<i>Ferns</i>)
LINDSAY M. BLACK, Ph.D.	<i>Curator of Plant Pathology</i>
LAURA M. BREWSTER	<i>Stenographer</i>
LOUIS BUHLE	<i>Custodian and Photographer</i>
MICHAELA LE FRERE CARROLL	Instructor
RALPH H. CHENEY, Sc.D.	Investigator (<i>Economic Plants</i>)
ELIZABETH CLARKE, A.B.	Curatorial Assistant
FRANCES A. DÄMM, B.A.	Office Assistant
CHARLES F. DONEY, M.S.	<i>Assistant Horticulturist and Registrar</i>
THOMAS A. DONNELLY	<i>Secretary and Accountant</i>
WILLIAM H. DURKIN	Curatorial Assistant
ELMA EDSON	Assistant
CONSTANCE P. ELSON, B.A.	<i>Secretary to the Director</i>
ALLEN GAWADI, Ph.D.	Research Fellow
PAULINE GOULET, B.S.	Research Assistant
ARTHUR HARMOUNT GRAVES, Ph.D.	<i>Curator of Public Instruction</i>
ALFRED GUNDERSEN, Docteur de l'Université (Paris)	<i>Curator Emeritus</i>
ELIZABETH HESS, F.R.H.S., N.D.H.	<i>Teaching Fellow</i>
ESTHER ANN HUEBNER, A.B.	Instructor
WILLIAM E. JORDAN, B.S.	Librarian
SALLY KELLY, Ph.D.	Research Fellow
JEANETTE KRUPKA	<i>Stenographer</i>
CONRAD B. LINK, Ph.D.	Horticulturist
FRANCES M. MINER, M.A.	<i>Curator of Elementary Instruction</i>
FAY D. MONTROSS	Assistant Secretary
GEORGE M. REED, Ph.D.	<i>Curator Emeritus</i>
ELIZABETH DEAN RUBINS, A.B.	Library Assistant
HESTER M. RUSK, A.M.	Instructor
BARBARA SHALUCHA, M.S.	<i>Assistant Curator of Elementary Instruction</i>
ELLEN EDDY SHAW, M.A.	<i>Curator Emeritus</i>
ELIZABETH REMSEN VAN BRUNT	<i>Honorary Curator of Culinary Herbs</i>
JOHN C. WISTER	<i>Editor of Plants & Gardens</i>
TERESA MAY ZERVAS	<i>Stenographer</i>

